7 of the RACSR (APTIM, 2021) were initial samples prior to over-excavation to remove lead-impacted soils. Post-over-excavation samples were found to be below the RG. Additionally, the landfill cap geomembrane and geosynthetic clay liner layers prevent vertical infiltration of rainfall from reaching the underlying landfill waste and promoting leachate. The geocomposite drainage layer carries any flow that infiltrates through the vegetative layer to the perimeter ditches. The surface water from the eastern half of the site will be collected by the eastern perimeter ditch and will drain directly into the Bay through the culvert pipe at the southeast corner of the site. The surface water from the western half of the site will be collected by the western perimeter ditch and will flow into the freshwater wetlands with excess runoff draining through the freshwater wetlands outfall pipe into the Bay. The chemically contaminated soils near the freshwater wetlands were removed during previous hot spot excavations and excavations during Phase II subgrade preparations, with confirmation testing to show that they are below action limits in the Final RACSR for copper, lead, total PCBs, and total TPHs. There is no required tie into the underlying Bay Mud at the Wetlands Boundary. Refer to Detail 4 on Design Drawing C18 from the DBR for the cover termination at the wetlands boundaries.

- **Concern: There may be impacts to soil due to RCRA hazardous waste handling in stockpiles during remedy installation**: Navy is planning, at agencies' request, to sample the soil under former Parcel E-2 stockpile locations now covered with radiological retesting radiological screening yard pads for metals to confirm that the stockpiles didn't impact the soils around them during storm events. This will be completed after the pads are removed.

6.5.1.3 Parcel UC-3

Yes. Based on the review of historical documents, annual O&M inspections, and the Five-Year Review inspection the remedy at Parcel UC-3 is functioning as intended.

Soil hotspot areas were removed through excavation and offsite disposal. Exposure pathways to residual COCs that could result in an unacceptable risk are being controlled through durable covers and ICs. Asphalt cover is in good condition, and any minor issues have been repaired. Groundwater has met RGs and response complete. Radiological concerns are addressed through previous radiological surveys and remediation of soil and structures (utilities) and radiological retesting, with the goal of unrestricted closure.

6.5.2 Question B: Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives Used at the Time of the Remedy Selection Still Valid?

6.5.2.1 Parcels E and E-2

Any changes in toxicity data or cleanup levels would not affect protectiveness because protectiveness is assured through the remedies for soil (excavation, durable covers and/or landfill cover, and ICs) that prevent exposure to COCs in soil. Similarly, although there may be changes with HHRA analysis for the construction worker scenario exposure to A-aquifer groundwater, those changes will not affect protectiveness because ICs will require identification and management of potential risks to construction workers.

Although residential use is an unlikely use scenario, the ROD establishes residential use-based cleanup levels for groundwater in the B-aquifer that are either a risk-based calculation, based on background, or established ARARs. **Tables 6-8** and **6-9** show the RGs and current comparison criteria for groundwater use as a domestic supply for Parcels E and E-2, respectively. There

have been no changes since the ROD for Parcel E. There are three COCs with current comparison criteria that are lower than the RG for Parcel E-2:

- The RG for 1,2,3-tricholoropropane (1 µg/L) was based on the practical quantitation limit at the time of the ROD (2012); however, the California MCL of 0.005 µg/L was promulgated in 2017 and the California MCL was identified as an ARAR.
- The RG for 4-nitrophenol is a risk-based calculation and is higher than the RSL for nitrobenzene, which is used as a proxy for 4-nitrophenol. The toxicity and chemical-specific information for nitrobenzene has not changed since the ROD was signed in 2012 and there have been no changes in exposure assumptions or site conditions that would affect the risk-based assumptions used in the ROD. Therefore, the RG for 4-nitrophenol remains protective.
- The risk-based RG for chromium VI is higher than the current RSL. The toxicity and chemical-specific information for chromium VI has also not changed since the ROD was signed in 2012 and there have been no changes in exposure assumptions or site conditions that would affect the risk-based assumptions used in the ROD. Therefore, the RG for chromium VI remains protective.

These changes do not affect protectiveness because parcel-wide ARICs prohibit the use of groundwater. Further, all three COCs were below detection limits during the 2022 BGMP sampling (TRBW, 2023). However, because 1,2,3-trichloropropane is based on an ARAR and the ARAR has changed since the ROD was signed, the Navy intends to update the BGMP to use a laboratory method that can meet the level of detection required to meet the California MCL of 0.005 µg/L and prepare post-ROD change documentation to update the RG for 1,2,3-trichloropropane consistent with the current ARAR.

The RAOs used at the time of remedy selection are still valid as there have been no changes to the planned future use and, apart from installing remedy components, there have been no changes in the site conditions that would impact the basis for the RAOs.

6.5.2.2 Parcel UC-3

Yes. Based on the results of the ARAR evaluation and HHRA analysis discussed in the following sections, the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection are still valid. Although there have been some changes to toxicity values and risk assessment methods, these changes do not affect remedy protectiveness.

ARAR Evaluation

The Navy evaluated the ARARs established in the ROD for Parcel UC-3. No changes to location-specific or action-specific ARARs that would affect the protectiveness of the remedies were identified. Changes to chemical-specific ARARs for individual chemicals are discussed in the HHRA Analysis.

The California Public Resources Code Division 20.6.5, California Sea Level Rise Mitigation and Adaptation Act of 2021, was passed in 2021; however, no regulations have been promulgated to implement the Act. The Navy is addressing SLR as discussed in **Section 1.4.2** of this Five-Year Review.

HHRA Analysis

As **Section 3.5.2.1** notes, in 2018, the State of California promulgated the TCR. However, the Navy continues to view the values identified in the USEPA IRIS database (a Tier 1 value) as the

primary source of toxicity factors for risk-related calculations. The HHRA evaluation was conducted by comparing the human health RGs from the ROD to current risk-based criteria based on the same exposure scenario, and ARARs, if available. Response complete for soil at UC-3 is achieved with hotspot excavation, durable cover construction and maintenance, and ICs as documented in the RACR for Parcel UC-3 (Gilbane, 2018b). Therefore, any changes in exposure assumptions and toxicity data for soil COCs would not affect protectiveness of the remedy.

Table 6-10 shows the RGs and current comparison criteria for groundwater. The RGs for the groundwater COCs included in the Parcel UC-3 ROD are based on consideration of exposure scenario-specific (construction worker trench exposure [A-aquifer]) risk-based concentrations (based on a cancer risk of 10^{-6} or a noncancer hazard index of 1), laboratory PQLs, chemical-specific ARARs, and Hunters Point groundwater ambient levels. There were only three groundwater COCs identified for Parcel UC-3: TCE, 1,2-dichloroethene (total), and VC.

While the construction worker scenario was selected as the only risk pathway for Parcel UC-3 RGs were compared to the following current comparison criteria for UU/UE:

- A-aquifer groundwater: VISLs calculated using the current USEPA VISL calculator for the residential and commercial scenarios (USEPA, 2022a).

Although the comparison criteria are lower than the RG, as discussed in **Section 6.4.3**, TCE was the only COC that was detected in groundwater and was below the 2008 groundwater criterion for vapor intrusion (2.9 µg/L) in 2009 and subsequent monitoring events. The groundwater data from 2015 and 2016 (final four sampling events) was below laboratory detection limits, which ranged from 0.3 to 0.5 µg/L (Gilbane, 2018b). Therefore, the conditions for UU/UE related to groundwater have been met and changes in toxicity, exposure scenarios, and ARARs do not affect protectiveness.

Radiological Risk Review

In October 2020, after the preparation of the Five-Year Review addenda, USEPA introduced a PRG calculation method called “Peak PRG,” which computes PRGs accounting for ingrowth and decay of progeny over time. An evaluation was performed for this Five-Year Review to assess whether this change affected the continued protectiveness of the current soil RGs for future residents. Exposure calculations were performed using the USEPA PRG Calculator (USEPA, 2022b). For this soil evaluation, the estimated excess cancer risk was calculated using the “Peak Risk” time interval of 1,000 years (Navy, 2020). The soil RGs were used as exposure point concentrations and the cumulative cancer risk was calculated as the sum of risks from all ROCs. **Appendix F** presents the calculated estimated excess cancer risks calculated from this evaluation and the supporting data. Under CERCLA, cleanup goals are considered protective if excess cancer risks from site exposures remain withing the 10^{-4} to 10^{-6} range. Based on the findings of this evaluation, the soil RGs are within this range and are protective for future residential exposures.

There were no changes to the risk assessment methods related to structures or buildings for radiological concerns since the last Five-Year Review.

6.5.3 Question C: Has Any Other Information Come to Light that Could Question the Protectiveness of the Remedy?

Yes. As identified in the Fourth Five-Year Review there is uncertainty with a portion of the radiological survey and remediation work. The Navy is in the process of implementing corrective

actions to ensure the radiological remedies specified in the decision documents were implemented as intended; however, this work is ongoing. Radiological retesting is currently being conducted at Parcel UC-3; long-term protectiveness will be confirmed upon completion.

6.6 Issues, Recommendations, and Follow-up Actions

Issues, recommendations, and follow-up actions were identified for Parcel UC-3 as summarized in **Table 6-9**.

6.6.1 Other Findings

The following findings were identified that do not directly relate to achieving or maintaining remedy protectiveness but are relevant to overall site management.

6.6.1.1 PFAS

As discussed in **Section 1.4.1**, a Basewide PA was conducted to identify potential PFAS release areas based on historical use or limited sampling data. There were no individual areas identified for investigation in the form of an SI with the exception of the general approach to sample all A-aquifer groundwater beneath Parcels E and E-2 (Multi-MAC JV, 2022). During the SI, PFOA, PFOS, PFNA, PFHxA (Parcel E-2 only), and PFHxS exceeded project screening levels in soil and groundwater (**Appendix G**) and additional investigation was recommended (Liberty JV, 2023).

There were no areas identified for investigation at Parcel UC-3. Exposure to groundwater is restricted by ICs within the HPNS, and the City and County of San Francisco prohibits installation of domestic wells within city and county limits.

6.6.1.2 Climate Resilience

The CRA estimates that groundwater emergence from SLR may occur within Parcel E and E-2 wetland areas by the year 2065 (**Appendix A**). Site-specific assessments are planned, which will include verifying mapping projections and evaluating the 2100 timeframe, at a minimum.

However, protectiveness is only affected when increased CERCLA risk attributable to climate hazards has been identified (groundwater is likely to emerge and land use is such that receptors could be exposed and a future unacceptable health or ecological risk has been identified, data collected, validated, and evaluated following CERCLA risk assessment processes resulting in unacceptable risk to receptors). Where the potential for increased vapor intrusion is identified in other CERCLA documents, ARICs for VOCs are present, groundwater is being monitored, and removal of VOCs is occurring either through MNA or active remediation, thus reducing the potential for future vapor intrusion by reducing the source. Therefore, the potential for groundwater emergence does not affect the protectiveness determination in this Five-Year Review.

At Parcel E, during the January 23, 2024, Five-Year Review site inspection, standing water was observed near the southern end of a bioswale. The source of the water was unclear and concerns were raised by the agency representatives whether this was climate-related flooding. There were rain events before the site visit and the area is undergoing final cover installation and grading which may have been causing poor drainage. This area will be evaluated during site-specific studies.

At Parcel E-2, additional potential vulnerabilities were identified that could affect the LFG treatment system, such as vulnerability to power outages from extreme weather events or

wildfires. However, the LFG system is currently solar powered and O&M of the remedy includes routine inspections conducted during monitoring events and inspections following any catastrophic event (earthquakes, floods, or fires and explosions). Repairs will be made promptly for continued operation and to ensure protectiveness of the remedy (ERRG, 2014). The Parcel E-2 remedy design includes several additional components that make the remedy resilient through the year 2065 including the seawall, slurry walls, and freshwater and tidal wetlands that are discussed in detail in **Appendix A**. Although the Parcel E-2 remedy components such as the sea wall were designed for resilience through a 3-foot rise in sea level (similar to the 2065 scenario), a site-specific study is recommended to evaluate the longer-term scenarios, such as 2100.

There are no estimated effects from SLR on Parcel UC-3.

6.6.1.3 Site Management Strategy

Parcel UC-3 groundwater has achieved response complete and poses no unacceptable risk for unlimited use/unrestricted exposure (Gilbane, 2018b). The Navy plans to remove groundwater ICs, which are no longer necessary to ensure protection of human health and the environment.

6.6.1.4 Remediation Goal Updates

The California MCL for 1,2,3-trichloropropane was promulgated after the Parcel E-2 ROD was finalized. The Navy intends to prepare post-ROD change documentation to reflect this change.

6.6.1.5 Parcel E-2 Other Findings

The remedy at Parcel E-2 is complex and involves multiple phases of field work to install. A number of facilities that are important to understanding groundwater flow and contaminant concentrations have been completed or are substantially completed (for example, Nearshore Slurry Wall and landfill cover). The following is a summary of the remaining Remedial Action (RA) work, interim studies, and key milestones planned before completing the Remedial Action Completion Report:

- Evaluate the effect of landfill cap and slurry walls on groundwater including flow, leachate attenuation, and potential impact to the San Francisco Bay, anticipated by after the approval of the Parcel E-2 Phase IV work plan by the FFA regulatory agencies, anticipated by Spring 2027.
- Collect confirmation soil samples for lead in the wetland areas following the excavation, anticipated by Summer 2027.
- Collect confirmation soil samples for PCBs, PAHs, pesticides and metals for the soil stockpile area, anticipated by Summer 2026.
- Construct remaining components of the remedy including the permanent landfill gas system, freshwater and tidal wetlands, and groundwater monitoring network under the approved Final Work Plan (KEMRON, 2018):
  - Landfill Gas System (Phase IVa) anticipated in 11/30/2026
  - Wetlands (Phase IVb) anticipated in 11/30/2027
- Modify the landfill gas monitoring program to include a monitoring probe (GMP54) outside of the recently expanded landfill cover as a new compliance point by revising the appropriate primary document(s). The primary document(s) needing revision and the proposed schedule for revision will be further discussed with the FFA Regulatory Parties not later than 9/30/2024

- Document completion of the protective liner and final cover installation in the Phase III Remedial Action Construction Summary Report anticipated by 11/30/2024.
- Conduct a study to evaluate the performance of the upland slurry wall as documented in the Post-Remedial Action Performance Evaluation Work Plan to evaluate the performance of the Upland Slurry Wall Approval of the Final Workplan is anticipated by 11/15/2024, Fieldwork is anticipated to be completed in April 2025, Draft Report to Navy October 2025 and the Final Post-Construction Remedial Action Performance Report is anticipated by March 2026.

6.7 Statement of Protectiveness

6.7.1 Parcel E

Protectiveness Determination: Will Be Protective

Protectiveness Statement: The remedy at Parcel E Will be Protective upon completion of remedy construction and completion of the radiological retesting.

In the interim, exposures to COCs in soil, sediment, and groundwater are being controlled during construction using temporary sheet piles, erosion control measures, security fencing to prevent unauthorized access, and ICs. The RAOs for soil will be met through excavation and offsite disposal, closure of fuel and steam lines, installation of durable covers, and ICs. The RAOs for soil gas will be met through SVE or excavation to address VOCs, and ICs. The RAOs for shoreline sediment will be met through excavation and offsite disposal, durable cover installation, shoreline protection, and a sea wall. The RAOs for groundwater will be met through in situ groundwater treatment, installation of a belowground barrier, monitoring, and ICs.

The RAOs for radiologically impacted media will be met through radiological surveys, decontamination, and removal of radiologically impacted structures and soil and sediment, and ICs. The RAOs for NAPL will be met through removal and treatment of NAPL source, ISS, and containment.

Soil excavation to remove COC- and radiologically impacted soil has been completed. The following remedy components are under construction: installation of the shoreline armored revetment and the cement-bentonite slurry wall and belowground barrier, removal of sanitary sewer and storm drain lines, and excavation of NAPL followed by initiation of the ISS treatment. Groundwater is currently being monitored through the BGMP.

6.7.2 Parcel E-2

Protectiveness Determination: Will Be Protective

Protectiveness Statement: The remedy at Parcel E-2 Will be Protective upon completion of remedy construction.

Soil and sediment hotspots have been removed and the final cover is currently under construction. Landfill gas venting and monitoring is ongoing during construction activities. Exposure to soil and groundwater is currently being controlled through security fencing to prevent unauthorized access, signage, and ICs. The RAOs for soil will be met through hotspot removal, soil cover and sea wall, and ICs.

The radiological RAOs will be met through radiological screening and removal, installation of a soil cover with demarcation layer, and ICs. The RAOs for landfill gas will be met through landfill gas monitoring, removal, and treatment, landfill cover monitoring, and ICs. The RAOs for groundwater will be met through LTM and ICs. The RAOs for surface water will be met through

installation of the protective soil cover, slurry walls, diversion to tidal and non-tidal constructed wetlands, and outfall monitoring.

The following activities have been completed: soil excavation to remove COC- and low-level radiologically impacted soil, installation of soil layer of radiologically cleared soil and a soil cover, installation of the shoreline armored revetment, cement-bentonite slurry walls along the shoreline and in the upland portion of the parcel, and the installation of a portion of the landfill gas collection and treatment system. Groundwater is currently being monitored through the BGMP.

6.7.3 Parcel UC-3

Protectiveness Determination: Short-term Protective

Protectiveness Statement: The remedy at Parcel UC-3 is currently protective of human health and the environment. In order to determine whether the remedy can be considered protective in the long term, the radiological retesting work must be completed.

The RAOs for soil are met through hotspot excavation, durable covers and ICs. Groundwater RGs have been met. Radiological retesting is planned to confirm that levels in soil are protective of human health. Until retesting is complete, short-term protectiveness is met through Navy controls such as access to the parcel through fencing, locked gates, and ICs (restricting intrusive work and maintaining durable covers).

6.8 References

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Table 6-1. Parcels E and UC-3 Chemicals of Concern and Remediation Goals

Exposure Medium	Exposure Scenario	Chemical of Concern	ROD Remediation Goal (2013, 2014)	Source of Remediation Goal	Parcel
Soil (mg/kg)	Residential	3,3'-Dichlorobenzidine	1.6	RBC	E
		4-Nitrophenol	0.29	RBC	E
		4,4'-DDD	2.1	RBC	E
		4,4'-DDE	1.6	RBC	E
		Aldrin	0.024	RBC	E
		alpha-BHC	0.0019	RBC	E
		Antimony	10	RBC	E, UC-3
		Aroclor-1254	0.093	RBC	E
		Aroclor-1260	0.21	RBC	E, UC-3
		Arsenic	11.1	HPAL	E
		Benzene	0.18	RBC	E, UC-3
		Benzo(a)anthracene	0.37	RBC	E, UC-3
		Benzo(a)pyrene	0.33	PQL	E, UC-3
		Benzo(b)fluoranthene	0.34	RBC	E, UC-3
		Benzo(k)fluoranthene	0.34	RBC	E, UC-3
		Bis(2-ethylhexyl)phthalate	1.1	RBC	E, UC-3
		Cadmium	3.5	RBC	E, UC-3
		Carbazole	2.2	RBC	E
		Copper	160	RBC	E, UC-3
		Dibenz(a,h)anthracene	0.33	PQL	E, UC-3
		Dieldrin	0.0033	PQL	E
		gamma-BHC	0.0026	PQL	E
		Heptachlor epoxide	0.0017	RBC	E, UC-3
		Indeno(1,2,3-cd)pyrene	0.35	RBC	E, UC-3
		Iron	58,000	HPAL	E, UC-3
		Lead	155	RBC	E, UC-3
		Manganese	1,431	HPAL	E, UC-3
		Mercury	2.28	HPAL	E, UC-3
		n-Nitroso-di-n-propylamine	0.33	PQL	E
		n-Nitrosodiphenylamine	0.68	RBC	E
		Naphthalene	1.7	RBC	E
		Pentachlorophenol	2.6	RBC	E
		Thallium	5	RBC	E, UC-3
		Vanadium	117	HPAL	E, UC-3
		Trichloroethene	2.9	RBC	E
		Zinc	370	RBC	E, UC-3
		Xylene	270	RBC	E, UC-3
		Total TPH [a]	3,500	--	E, UC-3
	Recreational	Aroclor-1254	0.74	RBC	E
		Aroclor-1260	0.74	RBC	E, UC-3
		Arsenic	11.1	HPAL	E, UC-3
		Benzo(a)anthracene	1.3	RBC	E, UC-3
		Benzo(a)pyrene	0.33	PQL	E, UC-3
		Benzo(b)fluoranthene	1.3	RBC	E, UC-3

Table 6-1. Parcels E and UC-3 Chemicals of Concern and Remediation Goals

Exposure Medium	Exposure Scenario	Chemical of Concern	ROD Remediation Goal (2013, 2014)	Source of Remediation Goal	Parcel
Soil (mg/kg)	Recreational	Benzo(k)fluoranthene	1.3	RBC	E, UC-3
		Chrysene	13	RBC	E
		Copper	470[a]	--	E, UC-3
		Dibenz(a,h)anthracene	0.33	PQL	E, UC-3
		Dieldrin	0.12	RBC	E
		Heptachlor epoxide	0.21	RBC	E, UC-3
		Indeno(1,2,3-cd)pyrene	1.3	RBC	E, UC-3
		Lead	155	RBC	E, UC-3
		Manganese	2,430	RBC	E, UC-3
		Mercury	210	RBC	E, UC-3
		n-Nitroso-di-n-propylamine	0.33	PQL	E
		Zinc	719[a]	--	E
		Total TPH [a]	3,500	--	E, UC-3
	Industrial	Arsenic	11.1	HPAL	UC-3
		Benzo(a)anthracene	1.8	RBC	UC-3
		Benzo(a)pyrene	0.33	PQL	UC-3
		Benzo(b)fluoranthene	1.8	RBC	UC-3
		Benzo(k)fluoranthene	1.8	RBC	UC-3
		Copper	76000	RBC	UC-3
		Dibenz(a,h)anthracene	0.33	PQL	UC-3
		Indeno(1,2,3-cd)pyrene	1.8	RBC	UC-3
		Lead	800	RBC	UC-3
		Total TPH [a]	3500	--	UC-3
	Construction Workers	1,2,4-Trichlorobenzene	230	RBC	E
		1,2,4-Trimethylbenzene	170	RBC	E
		1,3,5-Trimethylbenzene	69	RBC	E
		Aldrin	0.54	RBC	E
		Antimony	120	RBC	E, UC-3
		Aroclor-1248	2.1	RBC	E
		Aroclor-1254	2.1	RBC	E
		Aroclor-1260	2.1	RBC	E, UC-3
		Arsenic	11.1	HPAL	E, UC-3
		Benzene	9.4	RBC	E, UC-3
		Benzo(a)anthracene	6.4	RBC	E, UC-3
		Benzo(a)pyrene	0.65	RBC	E, UC-3
		Benzo(b)fluoranthene	6.5	RBC	E, UC-3
		Benzo(k)fluoranthene	6.5	RBC	E, UC-3
		Copper	11,000	RBC	E, UC-3
		Dibenz(a,h)anthracene	1.1	RBC	E, UC-3
		Dioxins/furans (TEQ)[b]	0.000023	--	E
		Indeno(1,2,3-cd)pyrene	6.5	RBC	E, UC-3
		Iron	93,000	RBC	E, UC-3
		Lead	800	RBC	E, UC-3

Table 6-1. Parcels E and UC-3 Chemicals of Concern and Remediation Goals

Exposure Medium	Exposure Scenario	Chemical of Concern	ROD Remediation Goal (2013, 2014)	Source of Remediation Goal	Parcel
Soil (mg/kg)	Construction Workers	Manganese	6,900	RBC	E, UC-3
		Mercury	93	RBC	E, UC-3
		n-Nitroso-di-n-propylamine	1.3	RBC	E
		Naphthalene	75	RBC	E
		Nickel	5,800	RBC	E
		Vanadium	310	RBC	E, UC-3
		Total TPH [a]	3,500	--	E, UC-3
Shoreline Sediment (mg/kg)	Ecological Receptors	Cadmium	3.14	HPAL	E
		Copper	124	HPAL	E
		Lead	218	RBC	E
		Mercury	2.28	RBC	E
		Molybdenum	2.68	HPAL	E
		Zinc	158	SF Bay Ambient Level	E
		Total DDT	0.0461	RBC	E
		Total Aroclors (PCBs)	0.2	SF Bay Ambient Level	E
Groundwater (µg/L)	Construction Worker Exposure to A-Aquifer Groundwater	1,2-Dichloroethene (total)	270	RBC	E, UC-3
		1,4-Dichlorobenzene	52	RBC	E
		Arsenic	39	RBC	E
		Benzo(a)anthracene	0.65	RBC	E
		Benzo(a)pyrene	0.05	PQL	E
		Benzo(b)fluoranthene	0.45	RBC	E
		Chrysene	6.7	RBC	E
		Indeno(1,2,3-cd)pyrene	0.31	RBC	E
		Naphthalene	16	RBC	E
		Pentachlorophenol	50	PQL	E
		Tetrachloroethene	18	RBC	E
		Trichloroethene	290	RBC	E, UC-3
		Vinyl chloride	5.4	RBC	E, UC-3
Groundwater (µg/L)	Domestic Use Exposure to B-Aquifer Groundwater	1,1- Dichloroethene	6	MCL	E
		cis-1,2- Dichloroethene	6	MCL	E
		trans-1,2- Dichloroethene	10	MCL	E
		1,4-Dichlorobenzene	5	MCL	E
		Arsenic	27.3	HPAL	E
		Manganese	8,140	HPAL	E
		Tetrachloroethene	5	MCL	E
		Thallium	12.97	HPAL	E
		Trichloroethene	5	MCL	E
		Vinyl chloride	0.5	MCL	E

Table 6-1. Parcels E and UC-3 Chemicals of Concern and Remediation Goals

Exposure Medium	Exposure Scenario	Chemical of Concern	ROD Remediation Goal (2013, 2014)	Source of Remediation Goal	Parcel
Groundwater (µg/L)	Aquatic Wildlife Exposure to A-Aquifer Groundwater	Total TPH (goals vary based on distance from the bay) [a]	1,400 to 20,000	--	E

[a] The total TPH remediation goal is based on the petroleum source criterion for HPNS

[b] Remediation goal for dioxins and furans is expressed as a TEQ, which is calculated by multiplying the concentration of each dioxin and furan congener by a toxicity equivalency factor established by the 2005 World Health Organization and based on each congener's toxicity relative to 2,3,7,8-tetrachlorodibenzo-p-dioxin.

Notes:

The distance-based TPH criteria are as follows:

Distance from shoreline		Distance from shoreline	
Feet	**Total TPH (µg/L)**	**Feet**	**Total TPH (µg/L)**
0–<25	1,400	125–<150	6,949
25–<50	1,467	150–<175	9,539
50–<75	2,092	175–<200	12,604
75–<100	3,216	200–<225	16,145
100–<125	4,839	≥225	20,000

< = less than
µg/L = microgram(s) per liter
BHC = benzene hexachloride
DDD = dichlorodiphenyldichloroethane
DDE = dichlorodiphenyldichloroethene
DDT = dichlorodiphenyltrichloroethane
HPAL = Hunters Point ambient level
HPNS = Hunters Point Naval Shipyard
MCL = maximum contaminant level
mg/kg = milligram(s) per liter
PCB = polychlorinated biphenyl
PQL = practical quantitation limit
RBC = risk-based concentration
ROD = Record of Decision
TEQ = toxic equivalent quotient
TPH = total petroleum hydrocarbons

Table 6-2. Parcel E-2 Chemicals of Concern and Remediation Goals

Exposure Medium	Exposure Scenario	Chemical of Concern	ROD Remediation Goal (2012)	Source of Remediation Goal
Soil & Sediment	Recreational (Soil)	Antimony	270	RBC
		Aroclor-1242	0.74	RBC
		Aroclor-1248	0.74	RBC
		Aroclor-1254	0.74	RBC
		Aroclor-1260	0.74	RBC
		Arsenic	11.1	HPAL
		Benzo(a)anthracene	1.3	RBC
		Benzo(a)pyrene	0.33	PQL
		Benzo(b)fluoranthene	1.3	RBC
		Benzo(k)fluoranthene	1.3	RBC
		Dieldrin	0.12	RBC
		Heptachlor epoxide	0.21	RBC
		Indeno(1,2,3-cd)pyrene	1.3	RBC
		Lead	155	RBC
		Total PCBs (Non-Dioxin)[a]	0.74	RBC
	Construction Worker (Soil)	4,4'-DDT	45	RBC
		Antimony	120	RBC
		Aroclor-1016	7.4	RBC
		Aroclor-1248	2.1	RBC
		Aroclor-1254	2.1	RBC
		Aroclor-1260	2.1	RBC
		Arsenic	11.1	HPAL
		Benzo(a)anthracene	6.5	RBC
		Benzo(a)pyrene	0.65	RBC
		Benzo(b)fluoranthene	6.5	RBC
		Benzo(k)fluoranthene	6.5	RBC
		Cadmium	150	RBC
		Copper	11,000	RBC
		Dibenz(a,h)anthracene	1.1	RBC
		Dieldrin	0.57	RBC
		Dioxin (TEQ)[b]	0.000023	RBC
		Heptachlor epoxide	1	RBC
		Indeno(1,2,3-cd)pyrene	6.5	RBC
		Iron	93,000	RBC
		Lead	800	RBC
		Manganese	6,900	RBC
		Naphthalene	75	RBC
		Total PCBs (non-dioxin)[a]	2.1	RBC
		Total TPH[c]	3,500	RBC
		Vanadium	310	RBC
	Terrestrial wildlife	Cadmium	4.2	RBC
		Copper	470	RBC
		Lead	197	RBC
		Manganese	2,433	RBC
		Mercury	1	RBC
		Nickel	1,941	RBC

Table 6-2. Parcel E-2 Chemicals of Concern and Remediation Goals

Exposure Medium	Exposure Scenario	Chemical of Concern	ROD Remediation Goal (2012)	Source of Remediation Goal
Soil & Sediment	Terrestrial wildlife	Vanadium	117	HPAL
		Zinc	719	RBC
		Total DDT	3.53	RBC
		Total PCBs	37	RBC
		Total HMW PAHs	231	RBC
	Aquatic Wildlife	Antimony	25	RBC
		Copper	270	RBC
		Lead	218	RBC
		Mercury	0.71	RBC
		Nickel	112	RBC
		Zinc	410	RBC
		Total DDTs	0.046	RBC
		Dieldrin	0.008	RBC
		Endrin	0.045	RBC
		Total PCBs	0.18	RBC
Groundwater (µg/L)	Domestic Use of Deep Groundwater (B-Aquifer)	1,1-Dichloroethane	5	PQL
		1,2,3-Trichloropropane	1	PQL
		1,2-Dichloroethane	0.5	MCL
		1,4-Dichlorobenzene	5	MCL
		4-Nitrophenol[d]	3.4	RBC
		Aroclor-1016	0.5	MCL
		Aroclor-1242	0.5	MCL
		Aroclor-1254	0.5	MCL
		Aroclor-1260	0.5	MCL
		Arsenic	10	MCL
		Benzene	1	MCL
		Benzo(a)anthracene	0.2	MCL
		Benzo(a)pyrene	0.2	MCL
		Benzo(b)fluoranthene	0.2	MCL
		Benzo(k)fluoranthene	0.2	MCL
		Bis(2-ethylhexyl)phthalate	10	PQL
		beta-BHC	0.05	PQL
		Carbon tetrachloride	0.5	MCL
		Chloroform	80	MCL
		Chromium VI	109	RBC
		Chrysene	0.56	RBC
		Dibenz(a,h)anthracene	2	MCL
		Dieldrin	0.02	PQL
		Heptachlor	0.01	MCL
		Heptachlor epoxide	0.01	MCL
		Heptachlor epoxide A	0.01	MCL
		Heptachlor epoxide B	0.01	MCL
		Indeno(1,2,3-cd)pyrene	0.2	MCL
		Iron	10,950	RBC
		Lead	15	MCL
		Methylene chloride	5	MCL

Table 6-2. Parcel E-2 Chemicals of Concern and Remediation Goals

Exposure Medium	Exposure Scenario	Chemical of Concern	ROD Remediation Goal (2012)	Source of Remediation Goal
Groundwater (µg/L)	Domestic Use of Deep Groundwater (B-Aquifer)	Naphthalene	1	PQL
		Tetrachloroethene	5	MCL
		Thallium	2	MCL
		Trichloroethene	5	MCL
		Vinyl chloride	0.5	MCL
	Wild Life in Bay	Total TPH	1,400 to 20,000	RBC

[a] Aroclor-1254 used for PCBs.

[b] Remediation goal for Dioxins/furans (TEQ) is based on 2,3,7,8-TCDD. The dioxin/furan TEQ is calculated by multiplying the concentration of each dioxin and furan congener by the toxicity equivalency factor established by the 2005 World Health Organization and based on each congener's toxicity relative to 2,3,7,8-tetrachlorodibenzo-p-dioxin.

[c] The total TPH remediation goal is based on the petroleum source criterion for HPNS.

[d] Nitrobenzene used as surrogate for 4-nitrophenol

Notes:

The distance-based TPH criteria are as follows:

Distance from shoreline		Distance from shoreline	
Feet	Total TPH (µg/L)	Feet	Total TPH (µg/L)
0–<25	1,400	125–<150	6,949
25–<50	1,467	150–<175	9,539
50–<75	2,092	175–<200	12,604
75–<100	3,216	200–<225	16,145
100–<125	4,839	≥225	20,000

< = less than
µg/L = microgram(s) per liter
BHC = benzene hexachloride
DDD = dichlorodiphenyldichloroethane
DDE = dichlorodiphenyldichloroethene
DDT = dichlorodiphenyltrichloroethane
HMW = high molecular weight
HPAL = Hunters Point ambient level
HPNS = Hunters Point Naval Shipyard
MCL = maximum contaminant level
mg/kg = milligram(s) per liter
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl
PQL = practical quantitation limit
RBC = risk-based concentration
ROD = Record of Decision
TCDD
TEQ = toxic equivalent quotient
TPH = total petroleum hydrocarbons

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Table 6-3. Parcels E and E-2 Remediation Goals for Radionuclides

Radionuclide	Surfaces (dpm/100cm^2)		Soil (pCi/g)		Parcel
	Equipment, Waste[a]	Structures[b]	Construction/Industrial/ Outdoor Worker [c]	Resident[c]	
Americium-241	100	100	5.67	1.36	E
Cesium-137	5,000	5,000	0.113	0.113	E, E-2
Cobalt-60	5,000	5,000	0.252 [d]	0.252 [d]	E, E-2
Plutonium-239	100	100	14	2.59	E
Radium-226	100	100	1.0 [e]	1.0 [e]	E, E-2
Strontium-90	1,000	1,000	10.8	0.331	E, E-2
Uranium-235	5,000	488	0.398	0.195	E

Source of Goals:

Department of the Navy (Navy). 2006. *Base-wide Radiological Removal Action, Action Memorandum – Revision 2006, Hunters Point Shipyard, San Francisco, California*. Final. April 21.

United States Environmental Protection Agency (USEPA). 2000. *Radionuclides Notice of Data Availability Technical Support Document*. Targeting and Analysis Branch, Standards and Risk Management Division, Office of Groundwater and Drinking Water. March.

[a] Based on "AEC Regulatory Guide 1.86" (1974). Goals for removable surface activity are 20 percent of these values

[b] Goals are based on 25 millirem per year (USEPA does not believe this NRC regulation is protective of human health and the environment, and the HPNS cleanup goals are more protective. This regulation is an ARAR only for radiologically impacted sites that are undergoing TCRAs and any additional remedial action required for those sites.)

[c] RGs for two future use scenarios; however, the residential RGs will apply in all Parcel E and E-2 areas. These more conservative RGs will enhance protectiveness of the remedial action, particularly as it relates to future property transfer and the potential need to apply institutional controls for radionuclides (Parcel E only).

[d] RG for Cobalt-60 was revised to support efficient laboratory gamma spectroscopy analysis of soil samples. This revised RG maintains morbidity risks within the U.S. Environmental Protection Agency-defined acceptable range and permits an exposure level that does not increase the risk of cancer from a potential exposure to Cobalt-60.

[e] Objective is 1 pCi/g above background per agreement with U.S. Environmental Protection Agency

AEC = Atomic Energy Commission
ARAR = applicable or relevant and appropriate requirement
cm^2 = square centimeter(s)
dpm = disintegration(s) per minute
HPNS = Hunters Point Naval Shipyard
NRC = Nuclear Regulatory Commission
pCi/g = picocurie(s) per gram
pCi/L = picocurie(s) per liter
RG = remediation goal
TCRA = time-critical removal action
USEPA = United States Environmental Protection Agency

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Table 6-4. Parcel E Remedial Action Summary and Expected Outcomes

Media	Risk/Basis for Action	Reasonably Anticipated Land Use	RAO	Remedy Component	Performance Metric	Expected Outcome
Soil	**Human Health:** Potential unacceptable risks to future recreational users from exposure to metals, SVOCs, pesticides, PCBs, and TPH in surface and subsurface soil; future residents from exposure to metals, VOCs, SVOCs, pesticides, PCBs, and TPH in surface and subsurface soil; future construction workers from exposure to metals, VOCs, SVOCs, pesticides, PCBs, and TPH in subsurface soil.	**Current use:** Limited access unoccupied and unused buildings **Planned future use:** Shoreline open space and multiuse open space, including residential and research and development	1. Prevent exposure of humans to inorganic and organic chemicals in soil at concentrations exceeding the remediation goals (see Table 5 of the Parcel E ROD [Navy, 2013]) for the following exposure pathways: a) Ingestion of, outdoor inhalation of, and dermal exposure to soil from 0 to 10 feet bgs by residents in areas zoned for mixed-use reuse b) Ingestion of homegrown produce in native soil in areas zoned for mixed-use reuse c) Ingestion of, outdoor inhalation of, and dermal exposure to soil from 0 to 2 feet bgs by recreational users in areas zoned for open space reuse d) Ingestion of, outdoor inhalation of, and dermal exposure to soil from 0 to 10 feet bgs by construction workers in all areas	Excavation and Offsite Disposal	Excavation and offsite disposal of Tier 1 (COCs in soil at concentrations 10 times the RGs), Tier 2 (COCs in soil at concentrations 5 times the RGs), and TPH (greater than 3,500 mg/kg of TPH) hotspot areas is currently in progress.	Land suitable for planned future use compatible with durable covers and ICs as required by the LUC RD.
				Closure of Fuel and Steam Lines	Inspection and removal of inactive fuel and steam lines that may be acting as a continuing source of COCs (particularly VOCs and SVOCs).	
				Durable Cover	Durable covers to provide physical barriers to prevent exposure of humans and wildlife to residual COCs in soil after excavation. Durable covers include: 1) A 2-foot (minimum) vegetated soil cover over the southern portion of Parcel E. The areas within IR-03 and the northwest portion of IR-02 will have a protective liner installed beneath the soil cover to minimize water seeping into contaminated soil. 2) A 6-inch (minimum) asphalt cover comprising 4 inches of aggregate base and 2 inches of asphalt over the northern portion of Parcel E. 3) A 3-foot (minimum) vegetated soil cover with a demarcation layer over IR-02 and IR-03 within the radiological ARIC; Cover installation is in progress and when installed, they will be inspected and maintained to prevent exposure to COCs.	
				ICs	ICs to maintain durable covers and security features, restrict land use and land disturbing activities, and prohibit growing produce in native soil for human consumption.	
Soil Gas	**Human Health:** Potential volatilization of VOCs and some SVOCs from soil into soil gas and/or indoor air via the VI pathway.		1. Prevent exposure of humans to VOCs in soil gas at concentrations that would pose unacceptable risk via indoor inhalation of vapors. Table 7 of ChaduxTt (2010), lists risk-based action levels for various volatile chemicals, including SVOCs and pesticides, that may pose an unacceptable risk via indoor inhalation of vapors. These soil gas action levels will be used for an initial risk-based screening of data collected during a future soil gas survey (such as the survey to be performed at Building 406 and VOC groundwater plumes following active treatment). After the initial risk-based screening, areas with unacceptable risk will be further evaluated using location-specific data (i.e., physical characteristics of the soil) to assess potential exposures consistent with the most current State of California and USEPA vapor intrusion guidance. In addition, risks and hazards at these areas will be further characterized using the accepted methodology for risk assessments at HPNS. Section 2.9.2.1 of the Parcel E ROD (Navy, 2013) provides additional information on the future soil gas survey and potential actions that may be prompted based on the results of the risk and hazard evaluation.	SVE	RA Pending: If Building 406 has not been demolished, operation of an SVE system where volatile chemicals are present in soil and soil gas until soil gas action levels are achieved or asymptotic conditions are reached. If Building 406 has been demolished at the time of the RA, excavation and offsite removal may be performed instead of SVE.	
				ICs	ICs to prohibit construction of enclosed structures unless prior written approval of vapor mitigation strategies is granted by the FFA signatories.	

Table 6-4. Parcel E Remedial Action Summary and Expected Outcomes

Media	Risk/Basis for Action	Reasonably Anticipated Land Use	RAO	Remedy Component	Performance Metric	Expected Outcome
Shoreline Sediment	**Human Health:** Potential unacceptable risk to future recreational users from exposure to PCBs in shoreline sediment. **Ecological:** Potential unacceptable risks to benthic invertebrates from exposure to metals, PCBs, and pesticides; to birds from PCBs; and to mammals from metals and PCBs in nearshore sediment.	**Current use:** Limited access unoccupied and unused buildings **Planned future use:** Shoreline open space and multiuse open space, including residential and research and development	1. Prevent exposure of humans to COCs in shoreline sediment at concentrations exceeding the remediation goals in Table 6 of the Parcel E ROD. 2. Prevent exposure of benthic invertebrates, birds, and mammals to COECs in shoreline sediment at concentrations exceeding the remediation goals in Table 6 of the Parcel E ROD (Navy, 2013).	Excavation and Offsite Disposal	Excavation of minimum 2.5 feet of nearshore sediment (the biologically active zone) and offsite disposal to remove COECs/COCs from nearshore sediment. The excavation will be backfilled with natural materials such as sand and rock.	Land suitable for planned future use compatible with durable covers and ICs as required by the LUC RD.
				Durable Cover and Sea Wall	Durable cover to provide a physical barrier to prevent exposure of humans and wildlife to residual COCs in nearshore sediment. The nearshore sediment durable cover consists of a minimum 4-foot layer of shoreline armoring a minimum 4-foot layer of shoreline armoring comprised of riprap overlying filter rock for steeper slopes (i.e., 3H:1V) and course sand overlying light riprap and filter rock for shallower slopes (i.e., 7H:1V). Shoreline revetment installation is in progress and when installed, they will be inspected and maintained to prevent exposure to COCs. To increase wave run-up protection above the +9 foot msl elevation for the armored revetment sections, a 3-foot high concrete seawall was constructed at the crest of the revetment, terminating at an elevation of 12 feet msl.	
Groundwater	**Human Health:** Potential unacceptable risks to future residents (adult and child) from exposure to metals, VOCs, SVOCs (primarily PAHs), pesticides, PCBs, and TPH in B-aquifer through domestic use; and future construction workers from exposure to SVOCs and lead in A-aquifer groundwater from direct exposure to A-aquifer groundwater and VOCs in trenches. **Ecological:** Potential migration of metals, PCBs, and pesticides in groundwater discharging to surface water at concentrations above surface water criteria for aquatic wildlife.		1. Prevent or minimize exposure of construction worker to VOCs in A-aquifer groundwater by dermal exposure and inhalation of vapors with chemicals exceeding remediation goals (Table 7 of the Parcel E ROD). 2. Prevent or minimize exposure of humans to COCs in the B-aquifer at concentrations exceeding remediation goals (Table 7 of the Parcel E ROD) via the domestic use pathway. 3. Prevent or minimize migration of arsenic, copper, lead, nickel, zinc, Aroclor-1254, Aroclor-1260, alpha-chlordane, and 4,4'-DDE to prevent discharge (into San Francisco Bay) that would result in concentrations exceeding corresponding surface water quality criteria for aquatic wildlife. 4. Prevent or minimize migration of A-aquifer groundwater containing total TPH concentrations greater than 1,400 µg/L (where commingled with CERCLA-regulated substances) into San Francisco Bay.	In-situ Treatment	In-situ treatment of groundwater through biological remediation or ZVI injections to remove VOCs from areas exceeding active treatment criteria. Groundwater remediation will be initiated after soil excavation and durable covers are installed.	
				Below-ground barrier	A cement-bentonite slurry wall will be installed to control discharge of contaminated groundwater along IR-02.	
				Groundwater monitoring	Groundwater monitoring will be conducted to assess treatment and below-ground barrier performance, COC concentration trends, plume stability, and attenuation of VOCs where MNA conditions are met after active treatment. Monitoring will continue until RGs are met.	
				ICs	ICs to prohibit construction of enclosed structures, the use of groundwater and installation of new groundwater wells for domestic purposes, and to restrict land disturbing activities which includes activities that causes or facilitates the movement of groundwater known to be contaminated with COCs unless prior written approval is granted by the FFA signatories	
Nonaqueous Phase Liquid	Presence of NAPL as a potential continuing source of COCs to soil and groundwater.		1. Prevent or minimize migration of NAPL to prevent discharge that would result in COEC concentrations greater than the surface water quality criteria for aquatic wildlife. 2. Prevent or minimize migration of NAPL to prevent discharge that would result in total TPH groundwater concentrations greater than 1,400 µg/L into San Francisco Bay.	Source Removal	Excavation of NAPL-impacted soils and nearshore sediment to the Bay Mud to remove the potential ongoing source to soil and groundwater at IR-03.	
				In-situ Stabilization	ISS consisting of cement-bentonite slurry and grout mixed with NAPL-impacted soil to create a soil-bentonite-cement monolith in the areas with the highest total TPH concentrations.	
				Containment	Containment of NAPL-impacted areas through a cement-bentonite slurry wall constructed at IR-03 and the surrounding area to encompass the extent of known groundwater contamination that may serve as a potential secondary source of COCs to groundwater.	

Table 6-4. Parcel E Remedial Action Summary and Expected Outcomes

Media	Risk/Basis for Action	Reasonably Anticipated Land Use	RAO	Remedy Component	Performance Metric	Expected Outcome
Radiologically Impacted Media	Human Health: Radiological risks for soil and structures (storm drains, sanitary sewers, buildings) were greater than 10^{-6}.	**Current use:** Limited access unoccupied and unused buildings **Planned future use:** Shoreline open space and multiuse open space, including residential and research and development	1. Prevent exposure to ROCs at activity levels that exceed remediation goals (see Table 8 of the Parcel E ROD [Navy, 2013]) for all potentially complete exposure pathways (which include external exposure, ingestion, and inhalation of soil based on the CSM for human health).	Survey, decontamination, and removal of radiologically impacted structures and soil	Identification and removal of historical subsurface storm drain and sanitary sewer utilities and screening and remediation of buildings, and former building sites as part of the TCRA for radionuclides. Radiological retesting is currently being conducted to confirm site conditions are compliant with the RAO.	Land suitable for planned future use compatible with durable covers and ICs as required by the LUC RD.
				ICs	ICs to restrict land disturbing activities which includes activities that causes or facilitates the movement of groundwater known to be contaminated with ROCs and to prohibit excavation below the demarcation layer unless prior written approval is granted by the FFA signatories	

References:

Department of the Navy (Navy). 2013. *Record of Decision for Parcel E, Hunters Point Naval Shipyard, San Francisco, California.* Final. December.

ChaduxTt. 2010. *Memorandum: Approach for Developing Soil Gas Action Levels for Vapor Intrusion Exposure at Hunters Point Shipyard, Hunters Point Shipyard, San Francisco, California*. Final. April 30.

µg/L = microgram(s) per liter
ARIC = area requiring institutional controls
bgs = below ground surface
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act
COC = chemical of concern
COEC = chemical of ecological concern
CSM = conceptual site model
DDE = dichlorodiphenyldichloroethane
FFA = Federal Facilities Agreement
HPNS = Hunters Point Naval Shipyard
IC = institutional control
ISS = in situ stabilization
LUC = land use control
mg/kg = milligram(s) per kilogram
MNA = monitored natural attenuation
msl = mean sea level
NAPL = nonaqueous phase liquid
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl
RA = remedial action
RAO = remedial action objective
RD = remedial design
RG = remediation goal
ROC = radionuclide of concern
ROD = Record of Decision
SVE = soil vapor extraction
SVOC = semivolatile organic compound
TCRA = time-critical removal action
TPH = total petroleum hydrocarbons
USEPA = United States Environmental Protection Agency
VI = vapor intrusion
VOC = volatile organic compound

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Table 6-5. Parcel E-2 Remedial Action Summary and Expected Outcomes

Media	Risk/Basis for Action	Reasonably Anticipated Land Use	RAO	Remedy Component	Performance Metric	Expected Outcome
Soil and Sediment	**Human Health:** Unacceptable risks to future recreational users and construction workers from exposure to metals, SVOCs, pesticides, PCBs, TPH landfill debris, and ROCs in soil and sediment. **Ecological:** Risks to wildlife from exposure to metals, pesticides, PCBs, and PAHs in soil and sediment.	**Current use:** Limited access, landfill **Planned future use:** Shoreline open space	1. Prevent human exposure to inorganic and organic chemicals at concentrations greater than remediation goals (see Table 5 of [Navy 2012]) for the following exposure pathways: a) Ingestion of, outdoor inhalation of, and dermal exposure to solid waste, soil, or sediment from 0 to 2 feet bgs by recreational users throughout Parcel E-2. b) Ingestion of, outdoor air inhalation of, and dermal exposure to solid waste, soil, or sediment from 0 to 10 feet bgs by construction workers throughout Parcel E-2. 2. Prevent ecological exposure to concentrations of inorganic and organic chemicals in solid waste or soil greater than remediation goals (see Table 5 of [Navy 2012]) from 0 to 3 feet bgs by terrestrial wildlife throughout Parcel E-2. 3. Prevent ecological exposure to concentrations of inorganic and organic chemicals in intertidal sediment greater than remediation goals (see Table 5 of [Navy 2012]) from 0 to 2.5 feet bgs by aquatic wildlife throughout the Shoreline Area.	Hot Spot Removal	Excavation and offsite disposal of soil, sediment, and debris with concentrations of COCs or COECs exceeding RGs for recreational/construction worker or ecological receptor and backfill with clean fill was completed. Freshwater and salt-water wetlands are being constructed in removal areas in the western portion of Parcel E-2.	Land suitable for planned future use compatible with durable covers and ICs as required by the LUC RD.
				Soil Cover and Sea Wall	Soil cover to provide a physical barrier to prevent exposure of humans and wildlife to residual COCs and debris in soil after excavation. The cover consists of a minimum 2-foot thick soil cover over the entire Parcel E-2 area with a geomembrane liner in all areas except the constructed wetland to minimize water seeping into the subsurface and deter burrowing animals. The liner foundation layer and final cover have been placed. Final construction of the landfill gas system is ongoing. A rock revetment and sea wall was constructed prior to installation of the cover to mitigate erosion. The soil cover and rock revetment/sea wall will be inspected and maintained prevent exposure to COCs and landfill debris.	
				ICs	ICs to maintain soil covers and security features, restrict land use and land disturbing activities, and prohibit growing produce in native soil for human consumption.	
			1. Prevent exposure to ROCs at activity levels that exceed remediation goals (see Table 6 of [Navy 2012]) for all potentially complete exposure pathways.	Radiological Screening and Removal	Radiological screening during hot spot removal, revetment and wetland creation, and soil cover installation to identify radiological contamination above the RG. If identified, materials will be removed and disposed of offsite. A final surface survey will be completed when all remediation activities are complete to identify and remove radiological contamination exceeding RGs to 1 foot bgs.	
				Demarcation Layer	A demarcation layer will be installed within the cover over potentially radiologically impacted areas and landfill material serves as a warning against digging into potentially contaminated materials.	
				ICs	ICs to prohibit excavation below the demarcation layer unless prior written approval is granted by the FFA signatories and CDPH.	

Table 6-5. Parcel E-2 Remedial Action Summary and Expected Outcomes

Media	Risk/Basis for Action	Reasonably Anticipated Land Use	RAO	Remedy Component	Performance Metric	Expected Outcome
Landfill Gas	**Human Health:** Unacceptable risks to potential future industrial and residential users from exposure to landfill gas vapors.	**Current use:** Limited access, landfill **Planned future use:** Shoreline open space	1. Control methane concentrations to 5 percent (by volume in air) or less at subsurface points of compliance. 2. Control methane concentrations to 1.25 percent (by volume in air) or less in onsite structures ("onsite" for this ROD is defined as any area within the subsurface points of compliance for landfill gas). 3. Prevent exposure to non-methane organic compounds (NMOCs) at concentrations greater than 500 ppmv at the subsurface points of compliance. 4. Prevent exposure to NMOCs at concentrations greater than 5 ppmv above background levels in the breathing zone of onsite workers and visitors.	Landfill Gas Removal and Treatment	Collection and treatment of landfill gas through a collection system and controlled flare to treat methane and/or adsorption to treat NMOCs. An interim system is currently operating and will be expanded when the landfill cover construction has been completed.	Land suitable for planned future use compatible with durable covers and ICs as required by the LUC RD.
				Landfill Gas Monitoring	Landfill gas monitoring will be performed to demonstrate compliance with ARARs.	
				ICs	ICs to prohibit construction of enclosed structures unless prior written approval is granted by the FFA signatories and the CDPH and complies with the substantive provisions of ARARs regarding post-closure land uses.	
Groundwater	**Human Health:** Unacceptable risks to potential future residential users from metals, VOCs, SVOCs, pesticides, and PCBs in groundwater if used as a potable source (B-aquifer)		1. Prevent exposure to groundwater that may contain COCs at concentrations greater than remediation goals (see Table 7 of [Navy 2012]) through the domestic use pathway. 2. Prevent or minimize migration of B-aquifer groundwater that may contain COCs at concentrations greater than remediation goals (see Table 7 of [Navy 2012]) beyond the point of compliance (defined in the RI/FS Report at the downgradient boundary of Parcel E-2).	LTM	Groundwater LTM to verify that chemical concentrations in groundwater do not exceed concentrations designated by the RAOs at the point of compliance.	
				ICs	ICs to prohibit extraction of groundwater and installation of new groundwater wells and prohibit use of or access to groundwater	
	Human Health: Unacceptable risks to potential future construction workers from dermal exposure to and vapor inhalation from lead and SVOCs in A-aquifer groundwater		1. Prevent or minimize dermal exposure to and vapor inhalation from A-aquifer groundwater containing COCs at concentrations greater than remediation goals (see Table 7 in [Navy 2012]) by construction workers.	ICs	ICs to restrict land disturbing activities which includes activities that causes or facilitates the movement of groundwater known to be contaminated with COCs or ROCs.	
	Ecological: Risks to aquatic wildlife from COECs (metals, anions, PCBs, and TPH) in groundwater through the groundwater to surface water pathway.		1. Prevent or minimize migration of COPECs to prevent discharge that would result in concentrations greater than the corresponding water quality criteria for aquatic wildlife. 2. Prevent or minimize migration of A-aquifer groundwater containing total TPH concentrations greater than the remediation goal (see Table 7 of [Navy 2012]) (where commingled with CERCLA substances) into San Francisco Bay.	Slurry Walls, Freshwater and Tidal Wetlands and Drain	Two slurry walls comprised of cement-bentonite mixture were installed to prevent migration of groundwater from the landfill to the bay and upgradient groundwater from entering the landfill material. The nearshore slurry wall was installed along the shoreline adjacent to the landfill and east adjacent area to prevent bayward groundwater in the landfill area from entering the bay. The upland slurry wall was installed from the northern parcel boundary to the southern extent of the landfill waste perpendicular to groundwater flow to divert upgradient offsite groundwater away from groundwater that contacts landfill waste. Groundwater will be diverted around the upland slurry wall or via a French drain system into the freshwater wetland. A study is planned to evaluate the performance of the upland slurry wall as a geological formation that prevented the wall from being installed as designed.	
Surface Water			1. Prevent or minimize migration of COPECs to prevent discharge that would result in concentrations greater than the corresponding water quality criteria for aquatic wildlife.			

Table 6-5. Parcel E-2 Remedial Action Summary and Expected Outcomes

Reference:

Department of the Navy (Navy). 2012. *Record of Decision for Parcel E-2, Hunters Point Naval Shipyard, San Francisco, California. Final.* November.

ARAR = applicable or relevant and appropriate requirement
bgs = below ground surface
CDPH = California Department of Public Health
COC = chemical of concern
COEC = chemical of ecological concern
COPEC = chemical of potential ecological concern
FFA = Federal Facilities Agreement
IC = institutional control
LTM = long-term monitoring
LUC = land use control
NMOC = non-methane organic compounds
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl
ppmv = part(s) per million volume
RAO = remedial action objective
RD = remedial design
RG = remediation goal
RI/FS = Remedial Investigation/Feasibility Study
ROC = radionuclide of concern
ROD = Record of Decision
SVOC = semivolatile organic compound
TPH = total petroleum hydrocarbons

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Table 6-6. Parcel UC-3 Remedial Action Summary and Expected Outcomes

Media	Risk/Basis for Action	Reasonably Anticipated Land Use	RAO	Remedy Component	Performance Metric	Expected Outcome
Soil	**Human Health:** Unacceptable risk to industrial workers from exposure to metals, SVOCs and TPH; recreational users and residents from metals, SVOCs, pesticides, PCBs, and TPH; and construction worker from metals, SVOCs, PCBs, and TPH in surface and/or subsurface soil.	**Current use:** Utility corridor and railroad right-of-way **Planned future use**: Multiuse open space, including residential and research and development	1. Prevent unacceptable exposure of humans to chemicals and radionuclides in soil at concentrations exceeding the RGs (Table 7 of the Parcel UC-3 ROD [Navy, 2014]) for the following exposure pathways: a) Ingestion of, outdoor inhalation of, and dermal exposure to soil from 0 to 10 feet bgs by residents in areas zoned for mixed-use reuse. b) Ingestion of homegrown produce in native soil in areas zoned for mixed-use reuse. c) Ingestion of, outdoor inhalation of, and dermal exposure to soil from 0 to 10 feet bgs by construction workers in all areas. d) Ingestion of, outdoor inhalation of, and dermal exposure to soil from 0 to 10 feet bgs by industrial users of the railroad right-of-way.	Excavation and offsite disposal	Excavation of soil from areas with COC concentrations above 5 times the RGs for industrial and residential use were removed.	Land suitable for planned future use compatible with durable covers and ICs as required by the LUC RD.
				Durable covers	Durable covers installed in the eastern portion of UC-3 to provide physical barriers to prevent exposure to metals in soil. The durable cover consists of a 4-inch-thick (minimum) asphaltic pavement cover that was either newly installed or repaired existing cover to meet the minimum criteria in the RD. Covers were not required in the western portion of UC-3. Covers are inspected and maintained to prevent exposure to COCs.	
				ICs	ICs to maintain durable covers, restrict land use and land-disturbing activity, and prohibit growing produce in native soil in the areas zoned for mixed-use.	
Soil Gas	Potential volatilization of VOCs and from soil into soil gas and/or indoor air via the VI pathway.		1. Prevent exposure of humans to VOCs in soil gas at concentrations that would pose unacceptable risk via indoor inhalation of vapors. Table 7 of the final soil gas memorandum (ChaduxTt, 2010) lists risk-based action levels for various volatile chemicals, including SVOCs, that may pose an unacceptable risk via indoor inhalation of vapors. These soil gas action levels will be used for an initial risk-based screening of data collected during future soil gas surveys (such as the surveys to be performed at the IR Site 56 VOC groundwater plume following active treatment). After the initial risk-based screening, areas with unacceptable risk will be further evaluated using location-specific data (i.e., physical characteristics of the soil) to assess potential exposures consistent with the State of California and USEPA vapor intrusion guidance. In addition, risks and hazards at these areas will be further characterized using the accepted methodology for risk assessments at HPNS.	Soil Gas Survey	A soil gas survey was conducted to confirm whether concentrations of VOCs warranted ICs. Results exceeded the comparison criteria established in the Sampling and Analysis plan and the ICs for VOCs were retained over a portion of Parcel UC-3.	
				ICs	ICs to prohibit construction of enclosed structures unless prior written approval of vapor mitigation strategies is granted by the FFA signatories	
Groundwater	**Human Health:** Risk to industrial workers and residents from VOCs in A-aquifer through the vapor intrusion pathway, construction workers through vapors in trenches. Risks to potential future residents from metals and VOCs in B-aquifer groundwater via domestic use.		1. Prevent or minimize unacceptable exposure of humans to COCs in the B-aquifer at concentrations exceeding RGs via the domestic use pathway.	Groundwater Treatment and MNA	ISB and MNA were selected in the ROD to remove VOCs, specifically TCE, in groundwater; however, based on historical and current (2018) data, TCE concentrations were below RGs since 1996 and below the 2.9 µg/L vapor intrusion criteria since 2009 (Gilbane, 2018). Additional remediation for groundwater was not warranted since TCE concentrations were below RGs and natural attenuation processes had effectively reduced COCs below vapor intrusion criterion.	
				ICs	ICs to prohibit the use of groundwater and installation of new groundwater wells for domestic purposes	
			2. Prevent or minimize unacceptable exposure of construction workers to VOCs in A-aquifer groundwater by dermal exposure and inhalation of vapors with chemicals exceeding RGs.	ICs	ICs to restrict land-disturbing activity unless prior written approval is granted by the FFA signatories	

Table 6-6. Parcel UC-3 Remedial Action Summary and Expected Outcomes

Media	Risk/Basis for Action	Reasonably Anticipated Land Use	RAO	Remedy Component	Performance Metric	Expected Outcome
Radiologically Impacted Soil and Structures	**Human Health:** Radiological risks for soil and structures (storm drains and sanitary sewers) were greater than 10-6.	**Current use:** Utility corridor and railroad right-of-way **Planned future use**: Multiuse open space, including residential and research and development	1. Prevent exposure to radiological isotopes at activity levels that exceed remediation goals for all potentially complete exposure pathways (which include external exposure, ingestion, and inhalation of soil based on the CSM for human health).	Survey, decontamination, and removal of radiologically impacted structures and soil	Identification and removal of historical subsurface storm drain and sanitary sewer utilities and screening and remediation of buildings, and former building sites as part of the TCRA for radionuclides. Radiological retesting is planned to confirm site conditions are compliant with the RAO.	Land suitable for planned future use compatible with durable covers and ICs as required by the LUC RD.

References:

Department of the Navy (Navy). 2014. *Record of Decision for Parcel UC-3, Hunters Point Naval Shipyard, San Francisco, California*. Final. January.

ChaduxTt. 2010. *Memorandum: Approach for Developing Soil Gas Action Levels for Vapor Intrusion Exposure at Hunters Point Shipyard, Hunters Point Shipyard, San Francisco, California*. Final. April 30.

Gilbane. 2018 *Remedial Action Completion Report Parcel UC-3, Hunters Point Naval Shipyard. San Francisco, California.* July.

µg/L = microgram(s) per liter
bgs = below ground surface
COC = chemical of concern
CSM = conceptual site model
FFA = Federal Facilities Agreement
HPNS = Hunters Point Naval Shipyard
IC = institutional control
IR = Installation Restoration
ISB = in situ biodegradation
LUC = land use control
MNA = monitored natural attenuation
PCB = polychlorinated biphenyl
RAO = remedial action objective
RD = remedial design
RG = remediation goal
ROD = Record of Decision
SVOC = semivolatile organic compound
TCE = trichloroethene
TCRA = time-critical removal action
TPH = total petroleum hydrocarbons
USEPA = United States Environmental Protection Agency
VI = vapor intrusion
VOC = volatile organic compound

Table 6-7. Fourth Five-Year Review Parcel E Issues, Recommendations, and Follow-up Actions

Parcel/Site	Fourth Five-Year Review Protectiveness	Issue	Recommendation (Milestone)	Date Complete/Current Status
E and UC-3	Will be protective (E) Short-term protective (UC-3)	The Navy has determined that a significant portion of the radiological survey and remediation work completed to date was not reliable because of manipulation and/or falsification of data by one of its radiological contractors. A long-term protectiveness evaluation of the radiological RGs has not yet been completed for this fourth Five-Year Review, and it is currently not known if the RAOs for radionuclides have been achieved in Parcels B-1, B-2, C, D-1, D-2, G, E, UC-1, UC-2, and UC-3.	Refer to **Section 1.4.3** for the long-term protectiveness evaluation component of this recommendation. The Navy is in the process of implementing corrective actions to ensure that the radiological remedies specified in the decision documents are implemented as intended. It is anticipated that the radiological rework will be completed prior to the next Five-Year Review.	**Long-term Protectiveness Evaluation: Completed June 2020**. Addenda to the Fourth Five-Year Review were prepared to evaluate the Radiological RGs for soil and buildings. The conclusions of both reports were that the current RGs were protective of human health and the environment (Navy, 2020a, 2020b). **In progress.** The radiological retesting of soil at Parcel UC-3 was initiated in February 2019. Fieldwork activities were initiated in 2023. Radiological retesting will be summarized in a radiological removal action construction summary report anticipated to be completed in 2028. The radiological retesting of soil and surveys of building structures at Parcel E was initiated in Fall 2019. Fieldwork activities for radiological retesting are expected to begin in 2026. Radiological retesting will be summarized in a radiological removal action construction summary report anticipated to be completed in 2029.

References:

Department of the Navy (Navy). 2020a. *Addendum to the Five-Year Review, Evaluation of Radiological Remedial Goals for Soil, Hunters Point Naval Shipyard, San Francisco, California.* June 18.

Navy. 2020b. *Addendum to the Five-Year Review, Evaluation of Radiological Remedial Goals for Building Structures, Hunters Point Naval Shipyard, San Francisco, CA*. June 18.

RAO = remedial action objective
RG = remediation goal

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Table 6-8. Parcel E Chemicals of Concern and Current Comparison Criteria for Domestic Use of Groundwater

Exposure Medium	Exposure Scenario	Chemical of Concern	Values from ROD		Current Comparison Criteria				
			ROD Remediation Goal (2013, 2014)	Source of Remediation Goal	11/2022 USEPA RSL or VISL	Cancer/ Noncancer Basis	DTSC-SL	Cal MCL	USEPA MCL
Groundwater (µg/L)	Domestic Use Exposure to B-Aquifer Groundwater	1,1- Dichloroethene[a]	6	MCL	280	NC	130	6	7
		cis-1,2- Dichloroethene[a]	6	MCL	25	NC	12	6	70
		trans-1,2- Dichloroethene[a]	10	MCL	68	NC	110	10	100
		1,4-Dichlorobenzene	5	MCL	0.48	C	No value	5	75
		Arsenic	27.3	HPAL	0.052	C	0.0082	10	10
		Manganese	8,140	HPAL	430	NC	No value	None	None
		Tetrachloroethene	5	MCL	11	C	0.084	5	5
		Thallium	12.97	HPAL	0.2	NC	0.059	2	2
		Trichloroethene	5	MCL	0.49	C	No value	5	5
		Vinyl chloride	0.5	MCL	0.019	C	0.0098	0.5	2

[a] Remediation goals for select VOCs were added to the ROD because of their relationship to other VOCs (e.g., 1,1-dichloroethene and 1,2-dichloroethene are degradation products of trichloroethene) that were identified as chemicals of concern in the FS Report. The remediation goal for tetrachloroethene in A-aquifer groundwater is based on the risk-based criteria presented in the ROD for HPNS Parcel C. The remediation goals for 1,1-dichloroethene and 1,2-dichloroethene in B-aquifer groundwater are based on the State of California maximum contaminant limits.

µg/L = microgram(s) per liter
C = carcinogen
Cal = California
DTSC = California Department of Toxic Substances Control
FS = Feasibility Study
HPAL = Hunters Point ambient level
HPNS = Hunters Point Naval Shipyard
MCL = maximum contaminant level
NA = not available
NC = noncarcinogen
ROD = Record of Decision
RSL = Regional Screening Level
SL = screening level
USEPA = United States Environmental Protection Agency
VISL = vapor intrusion screening level
VOC = volatile organic compound

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Table 6-9. Parcel E-2 Chemicals of Concern and Current Comparison Criteria for Domestic Use of Groundwater

Exposure Medium	Exposure Scenario	Chemical of Concern	Values from ROD		Current Comparison Criteria				
			ROD Remediation Goal (2012)	Source of Remediation Goal	11/2022 USEPA RSL	Basis of RSL (C/NC)	DTSC-SL	Cal MCL	USEPA MCL
Groundwater (µg/L)	Domestic Use of Deep Groundwater (B-Aquifer)	1,1-Dichloroethane	5	PQL	2.8	C	2.8 (USEPA)	5	None
		1,2,3-Trichloropropane	1	PQL	0.00075	C	0.0002	0.005	None
		1,2-Dichloroethane	0.5	MCL	0.17	C	0.17 (USEPA)	0.5	5
		1,4-Dichlorobenzene	5	MCL	0.48	C	No value	5	75
		4-Nitrophenol[a]	3.4	RBC	0.14	C	No value	None	None
		Aroclor-1016	0.5	MCL	0.22	C	0.22 (USEPA)	None	0.5
		Aroclor-1242	0.5	MCL	0.0078	C	No value	None	0.5
		Aroclor-1254	0.5	MCL	0.0078	C	0.0079 (USEPA)	None	0.5
		Aroclor-1260	0.5	MCL	0.0078	C	No value	None	0.5
		Arsenic	10	MCL	0.052	C	0.0082	10	10
		Benzene	1	MCL	0.46	C	0.15	1	5
		Benzo(a)anthracene	0.2	MCL	0.03	C	0.017	None	None
		Benzo(a)pyrene	0.2	MCL	0.025	C	No value	0.2	0.2
		Benzo(b)fluoranthene	0.2	MCL	0.25	C	No value	None	None
		Benzo(k)fluoranthene	0.2	MCL	2.5	C	No value	None	None
		Bis(2-ethylhexyl)phthalate	10	PQL	5.6	C	No value	4	6
		beta-BHC	0.05	PQL	0.025	C	0.0014 (USEPA)	None	None
		Carbon tetrachloride	0.5	MCL	0.46	C	0.45 (USEPA)	0.5	5
		Chloroform	80	MCL	0.22	C	No value	80	80
		Chromium VI [b]	109	RBC	0.035	C	No value	50	100
		Chrysene	0.56	RBC	25	C	No value	None	None
		Dibenz(a,h)anthracene	2	MCL	0.025	C	0.0061	None	None
		Dieldrin	0.02	PQL	0.0018	C	0.00066 (USEPA)	None	None
		Heptachlor	0.01	MCL	0.0014	C	0.0014 (USEPA)	0.01	0.4
		Heptachlor epoxide	0.01	MCL	0.0014	C	0.0014 (USEPA)	0.01	0.2
		Heptachlor epoxide A	0.01	MCL	0.0014	C	0.0014 (USEPA)	0.01	0.2
		Heptachlor epoxide B	0.01	MCL	0.0014	C	0.0014 (USEPA)	0.01	0.2
		Indeno(1,2,3-cd)pyrene	0.2	MCL	0.25	C	No value	None	None
		Iron	10,950	RBC	14000	NC	No value	None	None
		Lead	15	MCL	15	NC	No value	15	15
		Methylene chloride	5	MCL	11	C	1.70	5	5
		Naphthalene	1	PQL	0.12	C	0.12	None	None
		Tetrachloroethene	5	MCL	11	C	0.084	5	5
		Thallium	2	MCL	0.2	NC	0.059	2	2
		Trichloroethene	5	MCL	0.49	C	No value	5	5
		Vinyl chloride	0.5	MCL	0.019	C	0.0098	0.5	2

[a] Nitrobenzene used as surrogate for 4-nitrophenol

[b] MCLs shown are for total chromium, no MCLs available for Chromium VI

Note:

Shading indicates current comparison criteria is lower than ROD remediation goal

BHC = benzene hexachloride
C = carcinogen
Cal = California
DTSC = California Department of Toxic Substances Control
MCL = maximum contaminant level
NA = not available
NC = noncarcinogen
PQL = practical quantitation limit
RBC = risk-based concentration
ROD = Record of Decision
RSL = Regional Screening Level
SL = screening level
USEPA = United States Environmental Protection Agency

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Table 6-10. Parcel UC-3 Chemicals of Concern and Current Comparison Criteria for Groundwater

Exposure Medium	Exposure Scenario	Chemical of Concern	Values from ROD			Current Comparison Criteria (for UU/UE scenario)				
			ROD Remediation Goal (2013)	Source of Remediation Goal	Parcel	11/2022 USEPA RSL or VISL	11/2022 USEPA RSL or VISL[a]	DTSC-SL	Cal MCL	USEPA MCL
Groundwater (µg/L)	Construction Worker Exposure to A-Aquifer Groundwater	1,2-Dichloroethene (total)	270	RBC	UC-3	109	NC	NA	6 / 10	70 / 100
		Trichloroethene	290	RBC	UC-3	1.19	C	NA	5	5
		Vinyl chloride	5.4	RBC	UC-3	0.147	C	NA	0.5	2

[a] VISL for residential use presented for A-aquifer groundwater for conservative comparison.

Note:
Shading indicates current comparison criteria is lower than ROD Remediation Goals.

µg/L = microgram(s) per liter
C = carcinogen
Cal = California
DTSC = California Department of Toxic Substances Control
MCL = maximum contaminant level
NA = not available
NC = noncarcinogen
RBC = risk-based concentration
ROD = Record of Decision
RSL = Regional Screening Level
SL = screening level
USEPA = United States Environmental Protection Agency
UU/UE = unlimited use and unrestricted exposure
VISL = vapor intrusion screening level

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Table 6-11. Parcel UC-3 Issues, Recommendations, and Follow-up Actions

Parcel	Issue	Recommendations/ Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness (Y/N)	
						Current	Future
UC-3	As identified in the Fourth Five-Year Review there is uncertainty with a portion of the radiological survey and remediation work performed between 2004 and 2016 under the Basewide Radiological Removal Action, Action Memorandum (Navy, 2006). The Navy is in the process of implementing corrective actions to ensure the radiological remedies specified in the decision documents were implemented as intended; however, this work is ongoing.	Complete radiological retesting at radiologically-impacted sites, including current and former buildings and soil areas investigated under the Radiological Removal Action, Action Memorandum (Navy, 2006) and areas where evaluations determined previous data were unreliable.	Navy	USEPA	3/2/2028	N	Y

Reference:

Navy. 2006. B*ase-wide Radiological Removal Action, Action Memorandum – Revision 2006, Hunters Point Shipyard, San Francisco, California*. Final. April 21.

Navy = Department of the Navy
USEPA = United States Environmental Protection Agency

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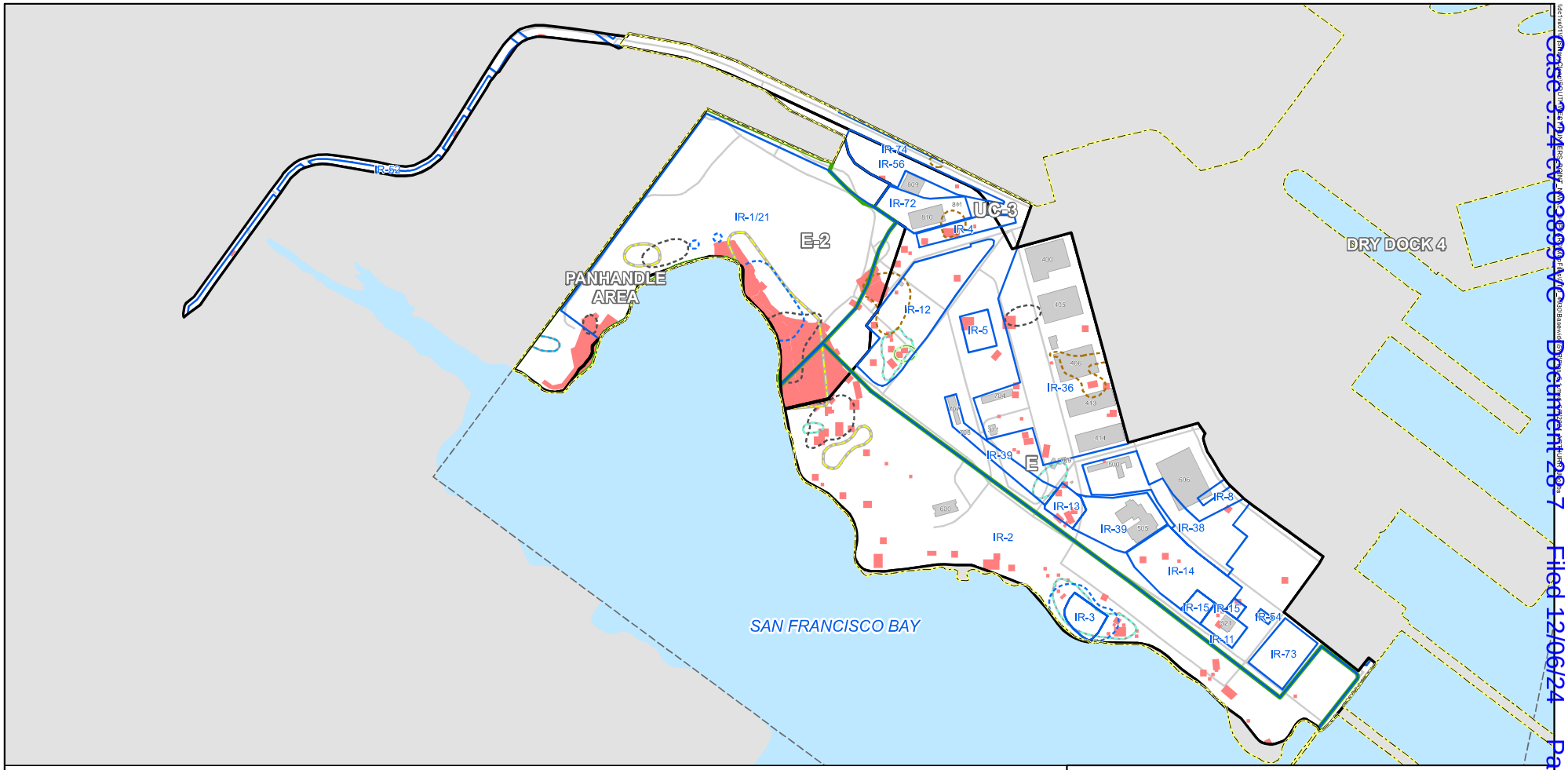
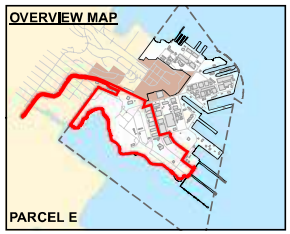


LEGEND

- Hunters Point Naval Shipyard Boundary
- Parcel Boundary
- Parcel F (Water) Boundary
- IR Site
- COC Excavation Area (Complete)
- ARIC for Potential Radionuclides
- Water
- Building
- Road

Plume Detection Area

- Anions
- Benzene
- Metals
- Nickel
- PCBs
- TPH
- VOC



COC = chemical of concern
IR = Installation Restoration
PCB = polychlorinated biphenyl
TPH = total petroleum hydrocarbons
VOC = volatile organic compound

0 300 600 Feet
1 inch = 600 feet

N

Parcel E (Parcels E, E-2, and UC-3)

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Hunters Point Naval Shipyard, San Francisco, California

NAVFAC

Figure 6-1

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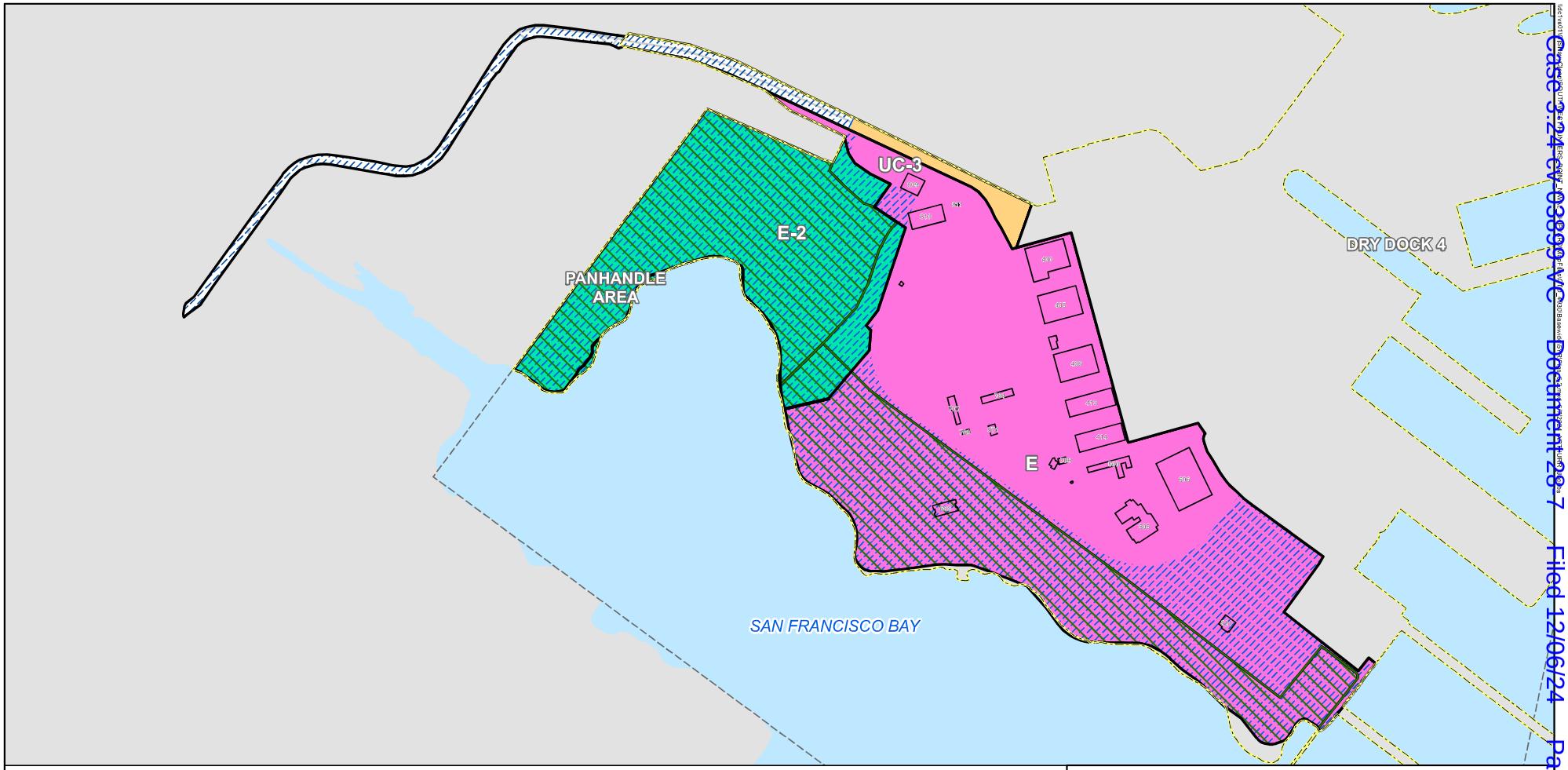
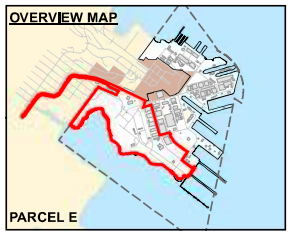


LEGEND

- Hunters Point Naval Shipyard Boundary
- Parcel Boundary
- Parcel F (Water) Boundary
- Water
- Building
- Road

Institutional Controls

- ARIC for Soil and Groundwater Use (General)
- Additional Restrictions (Open Space, Educational/Cultural, and/or Maritime/Industrial Use
- ARIC for Soil, Groundwater Use, and Restrictions Related to VOC Vapors
- Landfill Cap and Vegetative Cover
- ARIC for Potential Radionuclides



ARIC = area requiring institutional controls
VOC = volatile organic compound

0 300 600 Feet
1 inch = 600 feet

N

Parcel E (Parcels E, E-2, and UC-3) Institutional Controls

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Figure 6-2

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LEGEND:

- VEGETATIVE SOIL COVER WITH UNDERLYING PROTECTIVE LINER
- VEGETATIVE SOIL
- ASPHALTIC CONCRETE
- SVE REMEDIATION AREA
- SERVICE ROAD
- SHORELINE REVETMENT
- SHORELINE NATURAL SAND
- ISS TREATMENT AREA
- EXISTING FUEL LINES
- EXISTING STEAM LINES
- EXISTING STEAM LINES CLOSED IN PLACE (DURING PREVIOUS ACTION)
- GROUNDWATER CONTAMINANT PLUME
- SLURRY WALL
- PARCEL E BOUNDARY
- PARCEL BOUNDARY OTHER
- MOBILE NAPL BOUNDARY
- DRAINAGE CHANNEL
- FINISH GRADE TOPOGRAPHIC CONTOUR LINE
- EXISTING GROUNDWATER MONITORING WELL (A– AND B–AQUIFER)
- NEW GROUNDWATER MONITORING WELL (A– AND B–AQUIFER)
- PROPOSED PIEZOMETER
- NEW SURVEY MONUMENT
- PROPOSED MONITORING/EXTRACTION WELL
- FENCE

N

0' 400'

Source:
Innovex-ERRG Joint Venture. 2019. *Fourth Five-Year Review, Hunters Point Naval Shipyard, San Francisco, California.* Figure 8. July.

Figure 6-3
Overview of Remedy Components for Parcel E
Fifth Five-Year Review Report
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San Francisco, California

NAVFAC

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Source:
Innovex-ERRG Joint Venture. 2019. *Fourth Five-Year Review, Hunters Point Naval Shipyard, San Francisco, California.* Figure 9. July.

Figure 6-4
Overview of Remedy Components for Parcel E-2
Fifth Five-Year Review Report
Hunters Point Naval Shipyard
San Francisco, California

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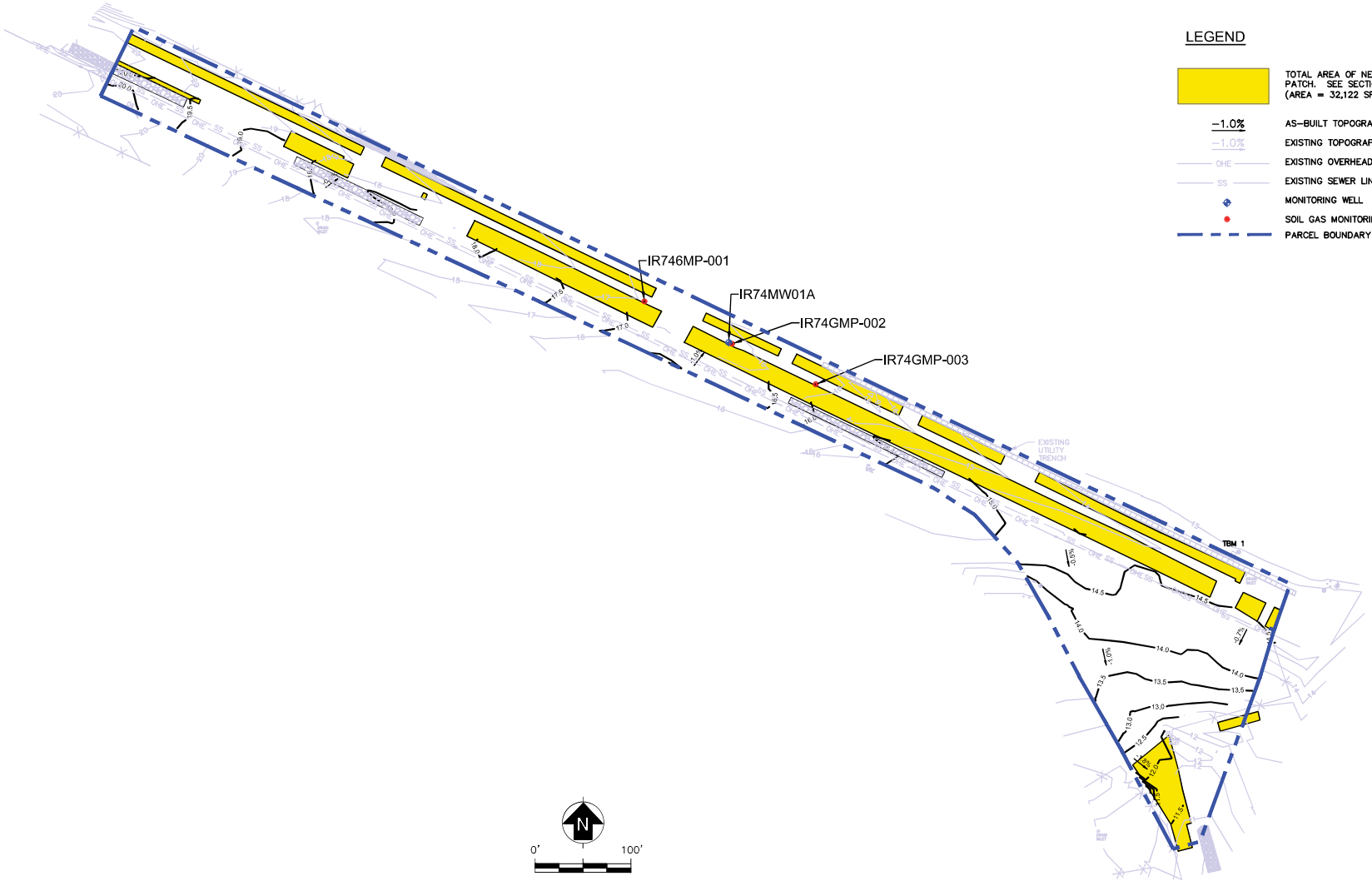

Source:
Innovex-ERRG Joint Venture. 2019. *Fourth Five-Year Review, Hunters Point Naval Shipyard, San Francisco, California.* Figure 13. July.

Figure 6-5
Overview of Remedy Components for Parcel UC-3
Fifth Five-Year Review Report
Hunters Point Naval Shipyard
San Francisco, California

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Appendix A
Climate Resilience Assessment

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Acknowledgments

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Acronyms and Abbreviations

bgs	below ground surface
BGMP	Basewide Groundwater Monitoring Program
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	chemicals of concern
CVOC	chlorinated volatile organic compound
CRA	climate resilience assessment
DoD	Department of Defense
DEM	digital elevation models
DCAT	DoD Climate Assessment Tool
DRSL	DoD Regional Sea Level Database
DTSC	California Department of Toxic Substances Control
GIS	Geographical Information System
GHG	greenhouse gas
HPNS	Hunters Point Naval Shipyard
IR	installation restoration
LFG	landfill gas
LTM	long-term monitoring
MSL	mean sea level
MHHW	Mean Higher High Water
Navy	Department of the Navy
OPC	California Ocean Protection Council
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
RD	remedial design
RG	remedial goal
ROD	Record of Decision
SLR	sea level rise
SVE	soil vapor extraction
USACE	U.S. Army Corps of Engineers
VLM	vertical land movement

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Executive Summary

As part of the fifth Five-Year Review, this screening-level Climate Resilience Assessment (CRA) assessed climate-related hazards, their potential impacts, and whether vulnerabilities were projected that may impact the protectiveness of the remedies at Former Hunters Point Naval Shipyard (HPNS) in San Francisco, California. The Department of the Navy used methodologies that are consistent with guidance provided in the Department of Defense (DoD) Climate Assessment Tool (DCAT) (Gade, et.al., 2020); U.S. Environmental Protection Agency's *Memorandum: Consideration of Climate Resilience in the Superfund Cleanup Process for NonFederal National Priorities List Sites* (2021); U.S. Army Corps of Engineers (USACE's) *Procedures to Evaluate Sea Level Change: Impacts, Responses, and Adaptation* (2014); and the Department of Toxic Substances Control's Draft *Sea Level Rise Guidance to DTSC Project Managers for Cleanup Activities* (2023). The HPNS CRA is a unique case study designed to address the concerns raised by the San Francisco Civil Grand Jury report regarding sea level rise (SLR) (City and County of San Francisco Civil Grand Jury, 2022).

Climate Change Hazards

The CRA evaluated eight climate-related hazards that were identified in DCAT. The eight hazards include: coastal flooding, extreme weather events, drought, wildfire, riverine flooding, extreme temperature, energy demand, and land degradation. The primary climate-related hazard identified for HPNS is coastal flooding. Coastal flooding is caused by SLR (that is, seawater inundation) and groundwater emergence. Groundwater table rise to within 3 feet below ground surface (bgs) was also assessed. Coastal flooding can either be permanent (because of permanent SLR) or transient (because of storm surges). Another climate hazard identified as relevant for HPNS included extreme weather events. Storm surges were evaluated as part of this CRA.

SLR projections developed for HPNS are based on the 2021 *DoD Regional Sea Level* (DRSL) database developed as part of the U.S. Climate Resilience Toolkit (U.S. Climate Resilience Toolkit, 2024). The DRSL database was developed in 2015 and periodic updates are planned. The 20-year and 50-year USACE planning and construction design time horizons lead to SLR projections for the years 2035 and 2065. The DRSL database provides Installation-specific, regionalized SLR scenarios for 1,744 active DoD and Base Realignment and Closure installations worldwide and is now being incorporated into the master planning at these installations.

The HPNS CRA used the highest greenhouse gas (GHG) emissions scenario for SLR projections of 1.0 feet and 3.2 feet for the years 2035 and 2065, respectively, to represent a conservative upper limit of the range of SLR scenarios evaluated in this assessment. Groundwater rise from SLR was conservatively projected based on a 1:1 ratio consistent with the City of Alameda's 2022 *Climate Adaptation and Hazard Mitigation Plan*. The DRSL projections take into account both SLR and vertical land movement (for example, land subsidence) and are generally consistent with the projections in the California Ocean Protection Council (OPC) and California Natural Resources Agency's *State of California Sea-Level Rise Guidance Document, 2018 Update* (CNRA and OPC, 2018) and the more recent OPC projections (OPC, 2024).

Potential Impacts and Vulnerabilities

Impacts are areas on an installation (or former installation) where climate change hazards are projected (for example, areas where seawater inundation is projected). The HPNS CRA identified the following potential impacts that may be attributable to climate change:

- In 2035, limited impacts from permanent groundwater emergence are projected to occur in Parcels D-1 and E-2 wetland areas (**Figure 3-1** and **Table 2-2**).
- In 2065, limited impacts from permanent groundwater emergence are projected to occur in Installation Restoration (IR) Sites 7 and 18 (IR-07/18), Parcels B-1 and B-2, C, D-1, E, and E-2 wetland areas (**Figure 3-2** and **Table 2-3**).

Validation of these impacts via site walkthroughs and site data reviews are important next steps. Not all impacts lead to vulnerabilities, which are defined as potentially complete exposure pathways. The HPNS CRA identified the following potential vulnerabilities resulting from the preliminary impacts previously identified:

- In 2035, a potential vulnerability of human receptors from permanent groundwater emergence at Parcels D-1 and E-2 wetland areas.
- In 2065, potential vulnerability of human receptors at the current ground surface from heavy metals due to groundwater emergence at IR-07/18, Parcels B-1, B-2, C, D-1, E, and E-2.
- In 2065, potential vulnerability to San Francisco Bay receptors from heavy metals due to groundwater emergence at IR-07/18, Parcels B-1, B-2, C, D-1, E, and E-2.

CRA Recommendations in the Five-Year Review

The first recommended next step is to conduct validation of the impacts and vulnerabilities identified in this CRA. If a vulnerability is projected to result in a potentially new exposure scenario for either human or ecological receptors through 2065, then an IR site-specific study will be discussed with the agencies to evaluate the potential Comprehensive Environmental Response, Compensation, and Liability Act risk to human and ecological receptors.

1. Based on 2035 SLR projections, an IR site-specific study for Parcels D-1 and E-2 wetland areas will be discussed with the agencies.
2. Based on 2065 SLR projections, IR site-specific studies for IR-07/18, Parcels B-1, B-2, C, D-1, E, and E-2 wetland areas will be discussed with the agencies.

1.0 Introduction

As part of Former Hunters Point Naval Shipyard's (HPNS's) fifth Five-Year Review, a Climate Resilience Assessment (CRA) was completed to evaluate potential impacts from climate change-related hazards to remedy protectiveness. The Department of the Navy (Navy) used methodologies that are consistent with guidance provided in the Department of Defense (DoD) Climate Assessment Tool (DCAT) (Gade, et.al., 2020), U.S. Environmental Protection Agency's *Memorandum: Consideration of Climate Resilience in the Superfund Cleanup Process for NonFederal National Priorities List Sites* (2021); U.S. Army Corps of Engineers' (USACE's) *Procedures to Evaluate Sea Level Change: Impacts, Responses, and Adaptation* (2014); and the California Department of Toxic Substances Control's (DTSC's) *Draft Sea Level Rise Guidance to DTSC Project Managers for Cleanup Activities* (2023). **Figure 1-1** describes the four screening steps used to complete this CRA and are as follows:

1. Climate Hazards: Identify climate change-related hazards that apply to HPNS using DCAT.
2. Climate Impacts: Areas that are projected to be impacted from the primary hazards identified in step 1.
3. Exposure Scenarios: Assess the potential for new exposure scenarios.
4. Vulnerability Assessment: Determine whether a potentially new exposure scenario exceeds the adaptive capacity of the site.

This screening-level CRA evaluated the following eight climate-related hazards identified in the DCAT: coastal flooding, extreme weather events, drought, wildfire, riverine flooding, extreme temperature, energy demand, and land degradation. **Table 1-1** describes the nature of these hazards.

The most important climate hazard and associated impact identified at HPNS is coastal flooding, because of its proximity to San Francisco Bay and because residual chemicals of concern (COCs) are present in subsurface soils and groundwater. Coastal flooding can be permanent (because of permanent sea level rise [SLR]) or transient (because of storm surges). The other relevant climate hazard identified was extreme weather events. This other hazard is considered relatively transient. Regarding extreme weather events, permanent SLR can amplify the impacts of storm surges, which was evaluated in this screening-level CRA. The following describes the sections provided in this Five-Year Review:

- **Section 2** assesses the coastal flooding hazard and identifies the parcels (and installation restoration [IR] sites) projected to be impacted by permanent seawater inundation or storm surges using the 2021 *DoD Regional Sea Level* (DRSL) database developed as part of the U.S. Climate Resilience Toolkit (U.S. Climate Resilience Toolkit, 2024).
- **Section 3** assesses the coastal flooding hazard in terms of SLR causing groundwater table emergence at the ground surface and identifies the areas affected. Groundwater table rise within 3 feet below ground surface (bgs) was also assessed.
- **Section 4** assesses whether or not the other seven hazards are projected to impact the parcels at HPNS.
- **Section 5** identifies the potential new exposure scenarios attributable to climate change applicable to residual COCs. It also assesses the adaptive capacity of the IR sites' remedies to the climate hazards in the areas of impact.

- **Section 6** presents the conclusions and recommendations of the screening-level CRA.
- **Section 7** presents the references cited.

2.0 Impacts of Seawater Inundation

HPNS is bounded on three sides by San Francisco Bay. Several parcels and IR sites are located near the current shoreline. It is expected that SLR will result in coastal flooding, primarily because of the upland advancement of seawater, but also because of groundwater emergence.

Flooding can either be permanent (for example, a rising mean sea level [MSL] and high tide) or transient (for example, storm surges or extreme precipitation events). Gradual and permanent SLR causes permanent seawater inundation of increasingly upland areas along the coast. For this assessment, permanent seawater inundation is defined by an upland area projected to be impacted by daily high tides, forming a permanently higher intertidal zone. Transient flooding is caused by storm surges that temporarily raise sea level and bring seawater temporarily upland. Transient flood waters recede within hours or days.

2.1 Sea Level Rise Projections

SLR projections developed for HPNS are based on the 2021 DRSL database for the years 2035 and 2065. The DRSL database was developed in 2015 and provides regionalized SLR scenarios for 1,744 active DoD and Base Realignment and Closure installations worldwide and is now being incorporated into the master planning at these installations. The years 2035 and 2065 are based on the 20-year and 50-year time horizons used by USACE for longer-term planning. The period 2023 through 2065 also approximates the 30-year timeframe discussed in the *Draft Sea Level Rise Guidance to DTSC Project Managers for Cleanup Activities* (DTSC, 2023), as the timeframe for a phased approach to plan.

DRSL is a scenario-driven tool. Scenarios are not deterministic or probabilistic, but rather they attempt to bound scientific and human-influenced future uncertainties (for example, level of future greenhouse gas [GHG] emissions). The advantage of DRSL is that it incorporates regional land subsidence estimates into the SLR projections. Adjustments to the regional scenarios of 2035 and 2065 were developed in DRSL on a site-specific basis and include local vertical land movement, dynamic sea level, and polar ice melt.

The DRSL projections for SLR, applicable to HPNS, are summarized in **Table 2-1**. For HPNS, DRSL projects an MSL rise of between 0.3 foot (lowest) and 1.0 foot (highest) by 2035, and between 0.6 and 3.2 feet by 2065 for the San Francisco Bay Area, using 1992 as the baseline year. **Figure 2-1** shows the actual SLR measured in five tide gauges nearest HPNS over the past 30 years (1992 through 2022). The difference between SLR projections for lowest and highest GHG emissions scenarios widens by 2065, as uncertainty grows over the trajectory of SLR, further out in time.

For HPNS, the highest GHG emissions and resulting SLR projections of 1.0 foot and 3.2 feet for the years 2035 and 2065, respectively (Table 2-1), are the most conservative projections in DRSL and were used as the upper limit of the range evaluated in this assessment. DRSL (2015) considers vertical land movement (VLM) in its SLR projections for both 2035 and 2065, as estimated through local tide gauges and continuous Global Positioning System stations. However, at installations like HPNS, where the projected VLM in 2035 is less than the estimated error (that is, 0.05 meter or 0.15 foot), VLM is assumed to be zero. Even if this low local VLM projection were to be included, it would not appreciably change HPNS' 2035 SLR projection. The DRSL projections for 2065 take into account both SLR and land subsidence of 0.3 feet.

DRSL projections are generally consistent with the projections in the *State of California Ocean Protection Council's Sea-Level Rise Guidance Document, 2018 Update* (CNRA and OPC, 2018)

and the 2024 California Ocean Protection Council (OPC) update (OPC, 2024). DoD plans to periodically update the DRSL guidance. DoD uses DRSL projections for the following: (1) Master Planning at installations for infrastructure protection and sustainability and (2) environmental protection planning. DoD is trying to maintain consistent maps for both. Simultaneously, the Navy is comparing DRSL projections with those from OPC and verifying that the two projections are similar. The Navy plans to assess the impacts of SLR in the year 2100 during site-specific studies.

The screening-level CRA was conducted to identify potential vulnerabilities to further assess in site-specific studies. DTSC's and OPC's climate change assessment guidance was considered in this CRA and will be considered further in the recommended site-specific studies. Recently, OPC lowered its SLR projections for future years, making the DRSL projections even more conservative. OPC (2024) now projects 0.4 to 0.7 foot SLR between 2030 and 2040, and 1.4 to 2.2 feet SLR between 2060 and 2070, making the Navy's projections even more conservative. The Navy's highest projection of 3.2 feet SLR by 2035 is also close to DTSC's climate resilience goal of 3.5 feet SLR by 2050 (DTSC, 2023). In accordance with DTSC guidance, the Navy will confirm that remedies are protective for the next 30 years.

2.2 Seawater Inundation Impacts

Seawater inundation, as previously described, is the permanent overland flooding of seawater that happens because of permanent MSL rise and daily high tides. The tidal datum Mean Higher High Water (MHHW) is a standard elevation used as a baseline, above which inundation often is depicted on digital elevation models (DEM) and inundation maps (Hall, 2016). The DEM for HPNS was developed in 2019. Similarly, MHHW is the standard vertical datum used in several online SLR mapping tools (for example, National Oceanic and Atmospheric Administration SLR Viewer and Naval Facilities Engineering Systems Command geo-readiness explorer Flood Inundation Surge Hazard). Therefore, this study has used MHHW in 1992 as the datum, above which SLR is mapped and the potential for seawater inundation of upland areas is evaluated. As a risk-averse case, an upland area is considered permanently flooded when it experiences daily flooding during high tide.

In addition, vertical land elevations in the U.S. were identified and referenced using the North American Vertical Datum and tidal datums are created through local surveys between tidal and geodetic benchmarks. Geographical Information System (GIS) mapping was used to compare the land topography to SLR projections. GIS maps were developed for the highest GHG emissions scenarios in **Table 2-1**. Several past and currently planned remedy design features are effective measures to prevent permanent seawater inundation in 2035 and 2065. These include a revetment and a seawall and berms along the coastline of Parcels E-2 and E. Additionally, 2 or 3 feet of fill has been added for vegetative covers in some parcels (NAVFAC, 2014). The vegetative soil covers were designed as part of ongoing remedies and are accounted for in the GIS mapping. Therefore, the DEM for HPNS was adjusted for Parcels E and E-2 to include the IR site management remedies (including additional fill, berms, and seawall extensions). Other adjustments to the land grade as a result of planned remedies in other parcels in the next 10 years should be added in future versions of the GIS maps. In all seawater inundation maps, any isolated low-lying areas showing upland accumulation of seawater were eliminated if they did not have connectivity with the sea.

Figures 2-2 and **2-3** show the potential for permanent seawater inundation in 2035 and 2065, for the highest SLR scenarios in DRSL. Except for some marginal seawater encroachment at the edges of some parcels, no permanent seawater inundation is projected in any of the parcels

during 2035 and 2065, under the highest SLR scenario. **Tables 2-2** and **2-3** lists the impacts of coastal flooding (seawater and groundwater) in the parcels at HPNS for the years 2035 and 2065, respectively. Permanent seawater inundation is not projected through year 2065 under the highest SLR scenarios.

2.3 Storm Surges

Storm surges can cause transient flooding and the surges have the potential to reach farther upland from the coastline in conjunction with SLR. DRSL projects that a 100-year storm surge would add 5.9 feet to the MHHW. Conservatively, it was assumed that the storm surge and high tide occur simultaneously. The transient flooding because of the combined effect of SLR and a 100-year storm surge is mapped on **Figures 2-4** and **2-5** for 2035 and 2065, respectively. As seen from the differences in the extent of flooding between 2035 and 2065, the degree of SLR projected greatly affects the size of the areas impacted by the storm surge. The following summarizes the potential effects from storm surges based on the highest SLR scenarios in 2035 and 2065:

- In 2035, a 100-year storm surge is not projected to impact Parcels D-2, F, UC-1, UC-2, or UC-3. Portions of IR-07/18, and Parcels B-1, B-2, C, D-1, E, and the low-lying areas of E-2 are projected to be impacted. The low-lying areas in the panhandle of Parcel E-2 are wetlands under construction as part of the Remedial Action. The wetlands are designed to mitigate the impact of storms (**Table 2-2**).
- In 2065, a 100-year storm surge would impact portions of all parcels except UC-3 (**Table 2-3**).

Impacts from storm surges will be addressed in accordance with the long-term monitoring (LTM) plan for each IR site or parcel. Storm events of a certain magnitude trigger an ad hoc inspection with repairs. Under the emergency response plans included in the operations and maintenance manuals for Parcels B-1 (ERRG, 2016), B-2 (INNOVEX-ERRG Joint Venture, 2018), C (Tetra Tech, Inc. and ERRG, 2017), D-1, (APTIM 2018, 2019), E-2 (ERRG, 2014b), G (Arcadis U.S., Inc., 2014), and IR-07/18 (ERRG, 2012), the following emergency response procedure is identified in the event of flooding, which is caused by intense storm events, high sea level, or wave action:

1. Immediately conduct visual inspection of area to assess damage and potential impact.
2. In the event of safety hazard, immediately cordon off the affected area.
3. In the event of slope failure, contact contracted geotechnical consultant, as appropriate, to participate in an evaluation of problem area with 48 hours. If necessary, conduct a geotechnical investigation of the failure to develop a corrective action plan.
4. For damage or potential damage to components that affect site integrity, security, or safety, arrange repair or restoration within 2 weeks (weather and conditions permitting) to design conditions and in accordance with construction specifications.
5. Investigate preventive measures.
6. Notify California Regional Water Quality Control Board, San Francisco Bay Region, and California's Department of Resources Recycling and Recovery (for IR-07/18 and Parcel E-2), Resident Officer in Charge of Construction, DTSC, U.S. Environmental Protection Agency, and the California Department of Public Health.

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3.0 Sea Level Rise Impacts on Shallow Groundwater

Groundwater emergence at the ground surface can occur in areas where the groundwater table is projected to rise above the current land surface from SLR. Impacts from groundwater table rise to within 3 feet of the ground surface was also evaluated to assess potential vulnerabilities to vapor intrusion or preferential pathways along underground utility corridors.

3.1 Groundwater Emergence

Groundwater table rise projections were prepared by the method described by Hoover et al. (Hoover, 2017). This is also the method used by the City of Alameda (City of Alameda, 2022) and May et al. (2024) for assessing climate-related impacts on the groundwater table. To determine permanent SLR-induced groundwater table rise, a 1:1 ratio of groundwater table rise to SLR was used, and the projected groundwater rise was added to a baseline as described in the next paragraph. It is unlikely that SLR will uniformly be linear at a 1:1 ratio in all parcels. However, this approximation is effective for areas that are flux controlled; that is, where the sea level and tidal fluctuations have influence over an aquifer (Plane E, 2019). The method is limited because it does not account for drainage features, such as swales, ditches, or storm drains. The method also assumes that the geology is homogeneous and that the wells are in flux with SLR. This method provides a conservative upper limit to groundwater rise because of SLR.

The HPNS Basewide Groundwater Monitoring Program (BGMP) has been collecting groundwater monitoring data, including groundwater elevations, regularly since 2002. This database was evaluated to determine the baseline potentiometric surface. The monitoring wells of primary focus in this assessment are screened in Aquifer A, which is the uppermost, unconfined water-bearing zone at HPNS. Wells IR39MW21A and PA39MW02A were selected as indicator wells because they are the closest to the area where groundwater emergence is projected to occur first. Measurements from 2002 to 2022 were reviewed to determine the date when the indicator wells had their highest groundwater elevations; the date determined was December 7, 2012, for both wells. Next, all monitoring wells with measurements on this date were further filtered to only provide monitoring wells screened within the water table Aquifer A. Ultimately, groundwater elevation measurements from a total of 125 monitoring wells from across HPNS that were measured on December 7, 2012, and screened within Aquifer A were then used to develop the baseline potentiometric surface.

Using the historical high groundwater table as the baseline to project its rise in 2035 and 2065 is similar to using MHHW as the baseline for assessing areas of seawater flooding. Given the daily fluctuations of the groundwater table in nearshore areas and annual fluctuations over one tidal epoch (19 years), the highest historical level in the last 20 years is used as the baseline to project future increases as a risk-averse case. Groundwater table rise projections in the impacted parcels will be further examined during site-specific studies.

The same adjusted DEM used to evaluate seawater inundation was used in this groundwater assessment. **Figures 3-1** and **3-2** show groundwater emergence at HPNS in 2035 and 2065, respectively. **Tables 2-2** and **2-3** provides a list of areas projected to be impacted by groundwater table rise in 2035 and 2065.

In summary, groundwater table emergence is expected to be minimal but present in Parcel D-1 and a small portion of E-2 wetlands by 2035 and is projected to appear in most parcels by 2065 in the highest SLR scenario. Although Figure 3-1 shows groundwater emergence in a small portion of the IR-07/18 and B-1 coastline, the projection is highly conservative and shows a

minimal area of impact nearshore in 2035. These parcels (IR-07/18, and B-1) are projected more clearly as impacted in the maps for 2065 and are identified as impacts for 2065 (along with Parcels B-2, C, D-1, E, and E-2). These mapping projections will be verified during site-specific studies, which are expected to include validation of well construction details and current ground elevation. The Navy will track actual water table trends in the HPNS BGMP, to compare measurements to projections over time.

3.2 Groundwater Table Rise to Within 3 Feet of Ground Surface

In addition to identifying areas of groundwater emergence, the similar methodology was applied to identify areas that may experience a groundwater table rise to a depth of 3 feet bgs. This is a depth at which building infrastructure, such as sewer lines, may be present; however, all sewer and storm drains have been removed at HPNS. The density requirement for backfilled trench soil is 90 percent relative density by test method ASTM D1557; therefore, it is unlikely to act as a preferential pathway.

The historical high groundwater table from December 2012 was used as the baseline. **Figures 3-3** and **3-4** show the areas where the groundwater table is projected to be within 3 feet bgs in 2035 and 2065, respectively. The following potential impacts from groundwater table rise were projected for 2035 and 2065 based on the highest SLR scenario:

- In 2035, IR-07/18 and Parcels D-2, E-2, UC-1, UC-2, and UC-3 are not impacted; however, limited areas in Parcels B-1, B-2, C, D-1, E, and G may experience groundwater table rise within 3 feet bgs (**Table 2-2, Figure 3-3**).
- In 2065, all parcels except Parcel UC-3 are impacted in limited areas by groundwater table rise to within 3 feet bgs. (**Table 2-3** and **Figure 3-4**).

4.0 Impacts of Other Climate Hazards

This section describes the other DCAT-identified climate hazards in addition to coastal flooding at HPNS. The following impacts from climate-related hazards are anticipated at HPNS:

- Extreme weather events. The number of days with extreme 1-day or 2-day precipitation events could increase.
- Drought. Future years could see extended periods of drought during the dry months and shorter wetter periods during wet months.
- Wildfires. Future years could see higher instances of wildfires following extended periods of drought.
- Energy demand. Future years could see more power outages, with potential impacts on the Parcel E-2 landfill operation.

After a storm event in March 2023, the Navy noted four locations of standing water, as follows: one in Parcel C, one in Parcel D-1, and two in Parcel E. As a preliminary trial, conductivity of the standing water was measured in an attempt to differentiate between rainwater and seawater, but no definitive determination could be made. Conductivity in three of the locations in Parcels C, D-1, and E was low, indicating that the water was likely rainwater ponding in troughs in asphaltic surfaces. The fourth ponding location in Parcel E, closer to the shoreline, showed elevated conductivity, but it was unclear if there was any seawater influence. Conductivity by itself may not be a good indicator of the source of flooding. These locations will be discussed more in the workplan for site-specific studies. Parcel-specific operations and maintenance manuals discuss routine inspections and inspections following storms (intense rainfall events) as triggers for an additional inspection.

Transient climate change phenomena that may impact a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) site will be managed and addressed as part of regular inspections, maintenance, and repairs as required in the land use control remedial design (RD) and applicable operations and maintenance and LTM plans for each IR site or parcel. **Table 4-1** presents the hazards and whether a parcel may be affected.

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5.0 Vulnerability Assessment

This section discusses the projected vulnerabilities as a result of potentially new future exposure scenarios from the primary hazard identified to impact HPNS: coastal flooding. A review of the remedy components at Parcel E-2 (landfill) that take into account climate resilience is also included in this section.

5.1 Assessment Methodology

The vulnerability assessment evaluates whether the impacts identified in this screening-level CRA indicate a projected new exposure scenario that may impact the CERCLA risk assessed at the IR site. If yes, a site is determined to be vulnerable. If no, the site is determined to be resilient. Factors that affect the assessment include COCs that may persist through 2035 and 2065, and whether there are new exposure pathways that were not previously addressed in the remedies.

COCs: Heavy metals are likely to persist at current (or post-remedy) levels in 2035 and 2065 and are potentially soluble in seawater and groundwater. Therefore, their potential to be mobilized through dissolution in flooded areas is identified as a vulnerability. In general, residual chlorinated volatile organic compounds (CVOCs) (after ongoing or planned source treatment and removal) are not expected to persist through 2065 and their attenuation will be monitored through the ongoing monitoring program. Polycyclic aromatic hydrocarbons (PAHs) and polychlorinated biphenyls (PCBs) are relatively insoluble and their mobilization potential is only through soil erosion. As HPNS has ubiquitous land covers (asphalt or vegetated soil), erosion of soil containing any residual (post-remedy) PAHs and PCBs is not identified as a vulnerability. The attenuation of any residual (post-remedy) COCs by 2035 or 2065 will be verified through the ongoing monitoring program and will be discussed with the agencies during planning of the site-specific studies.

New Exposure Pathways: Groundwater emergence because of SLR is projected to occur in limited areas beginning in 2035 as follows:

- In 2035, groundwater emergence is projected in a limited area in Parcels D-1 and E-2 (**Figure 3-1**).
- In 2065, groundwater emergence is projected in limited areas in IR-07/18, Parcels B-1, B-2, C, D-1, E, and E-2 (**Figure 3-2**).

Vulnerabilities: When the likelihood for migration of these COCs to potential receptors is assessed, the following vulnerabilities attributable to climate change are identified at HPNS:

- Potential vulnerability of human receptors at the ground surface to heavy metals because of groundwater emergence.
- Potential vulnerability of ecological receptors in the bay to heavy metals because of groundwater emergence.

The Navy has been monitoring water levels and COC trends for the past 21 years as part of the BGMP and will continue to monitor COC concentrations to inform the CRA in the next Five-Year Review.

5.2 Potential New Exposure Scenarios for Residual COCs

Residual COCs are expected to remain onsite in areas not remediated to unrestricted reuse in accordance with each parcel's Record of Decision (ROD) and the HPNS reuse plan.

Based on the description of the parcels, IR sites, COCs, and past or future remedies in this Five-Year Review, the following potential new exposure scenarios are identified as relevant to the primary climate hazard anticipated at HPNS, coastal flooding. Coastal flooding includes the impacts of permanent SLR, the associated groundwater emergence, and transient storm surges):

- Potential new exposure to CVOCs from vapor intrusion because of groundwater table rise to 3 feet bgs
- Potential new exposure of human receptors at the current ground surface to heavy metals because of groundwater emergence
- Potential new exposure of ecological receptors in the bay to heavy metals because of groundwater emergence

5.3 Assessing the Resilience to Coastal Flooding

Coastal flooding is the primary climate change hazard that is projected to impact HPNS. Parcel D-1 is the only parcel projected to be impacted in 2035. The following parcels are projected to be impacted in 2065: IR-07/18, Parcels B-1, B-2, C, D-1, and E. **Tables 5-1** and **5-2** list the results of this vulnerability assessment.

5.3.1 Potential New Exposure to CVOCs from Vapor Intrusion due to Groundwater Table Rise to 3 feet bgs

This exposure scenario examines a potential hypothetical future scenario, in which a rising groundwater table causes CVOC plumes to enter sewer lines or come in contact with foundations of buildings, thus increasing the potential for CVOC vapor intrusion into buildings, where occupants could potentially be exposed to CVOC vapors. This assessment found no new or increased exposure created in this scenario, based on the following findings:

- All sewer lines in the impacted parcels and IR sites with CVOC plumes have either been removed or will be removed.
- Following past and future treatment of source areas, most of the residual CVOC plumes in parcels like Parcels B-1 and G have been greatly reduced in concentration (NAVFAC, 2020). In Parcel C (IR 28), where previous treatment of a CVOC source left residual source mass, additional treatment (excavation and bioremediation) is planned. By 2035, any residual CVOCs in groundwater are projected to attenuate below remedial goals (RGs).

The CRA projects that any residual petroleum-based volatile organic compounds will be successfully remediated by 2035 and CVOCs by 2065. A 100 part-per billion chlorinated VOCs source should dissipate by approximately 99% over 41 years based on first-order decay and median point decay rates observed at chlorinated solvent natural attenuation sites (Newell et al., 2006). Ongoing sampling of relevant monitoring wells will be used to verify these assumptions. The goal of the CRA is to evaluate whether climate hazards, such as SLR or groundwater level rise, have the potential to create new or increased exposure pathways. Vapor intrusion is already being considered in current CERCLA documents, sewer lines in impacted areas have been removed, and there is no indication that any of the climate hazards will create new or

increased vapor intrusion. Vapor intrusion will be considered in applicable parcel-specific studies.

5.3.2 Potential New Exposure of Human Receptors at the Current Ground Surface to Heavy Metals due to Groundwater Emergence

This exposure scenario assesses the possibility that groundwater emergence could lead to new potential exposures to heavy metals at the ground surface. In some parcels, asphalt covers have been placed on soils that contain levels of residual heavy metals, in order to isolate them from potential aboveground receptors. If near -surface soils with elevated concentrations of heavy metals are present under the asphalt covers, a relatively permanent rise in the groundwater table could bring dissolved metals to the surface (through cracks in the asphalt or from the sides of the paved areas), without the attenuating effect of cleaner soil covers.

Depending on the varying land use scenarios, potential receptors could include construction workers, industrial workers, recreational users, or (in parts of Parcel C planned for mixed use) residents or residents growing produce (Table 4-3 in this Five-Year Review). Potential new exposures for these aboveground receptors are unlikely in areas with vegetative covers, namely, Parcel E-2 and portions of Parcels E (IR-2SE), B-1, and IR-07/18. However, this CRA found some potential vulnerabilities for these aboveground receptors in areas with asphalt covers, namely, Parcels D-1, B-2, and C and portions of Parcels E, B-1, and IR-07/18.

IR site-specific studies may be warranted in the future to evaluate the risk associated with this projected vulnerability.

5.3.3 Potential New Exposure of Ecological Receptors in the Bay to Heavy Metals due to Groundwater Emergence

As described in **Section 5.3.2**, in future climate-driven scenarios, residual heavy metals in vadose zone soil could dissolve in rising groundwater. In areas with a vegetative cover (with 2 or 3 feet of clean soil), the solubilized heavy metals are likely to sorb to clean soil along the path to the bay, as is evident in past groundwater data (TRBW, 2022). Past groundwater monitoring data show no sustained exceedance of aquatic ecology-based trigger levels, with a reduction in concentration of metals evident in monitoring wells in parcels where remedial excavations have taken place. One exception is heavy metals like zinc that exceed the trigger levels in monitoring well IR02MW373A in Parcel E. Additional excavation remedies are planned near this well in the future to target the exceedances here. Additionally, a nearshore slurry wall is planned to contain groundwater COCs before discharge to the Bay. This illustrates the continuous cycle of annual monitoring and refocusing of remedies that are already in place, leading to continuing improvements that are expected to help achieve the remedial action objectives at HPNS.

In areas with an asphalt cover, heavy metals in near-surface soils could emerge at the ground surface with the groundwater. In this scenario, there is potential for heavy metals in the emergent groundwater to migrate to the bay. Such migration could occur if the emerging groundwater laden with metals drains to the bay through surface features (for example, drainage swales or storm water drains) or merges with seawater during storm surges or rainstorms and then drains to the bay, potentially at levels that exceed surface water quality criteria for ecological receptors. Therefore, this scenario is a potential climate-driven vulnerability in areas with asphalt cover at HPNS.

5.3.4 Potential New Exposure of Subsurface Remedy Infrastructure to Saltwater Intrusion

The groundwater in many wells seems to show low conductivity, indicating that saltwater intrusion is not pervasive across the parcels. In a few monitoring wells, especially near the coastline the groundwater has elevated conductivity and is brackish, indicating that it may be elevated in saltwater components, such as chloride. None of the parcels have remedies that require ongoing use of subsurface remedy infrastructure (for example, no pump-and-treat systems with subsurface extraction wells). There is a soil vapor extraction (SVE) system at IR Site 10 in Parcel B-1 that has subsurface components, but it is slated for decommissioning, as it has reached asymptotic conditions. Parcel E-2 (landfill) is decommissioning its SVE wells and installing 34 landfill gas (LFG) extraction wells. There are several monitoring wells throughout all the parcels that will continue to be sampled in the future. Monitoring wells at HPNS are designed for brackish or saline environments and will undergo routine maintenance and/or replacement in the future. Therefore, all parcels at HPNS are resilient to this potential exposure scenario.

5.3.5 Potential New Exposure of Bay Ecological Receptors to Heavy Metals, PCBs and PAHs from Erosion due to Storm Surges

This scenario is considered because several parcels are projected to flood temporarily during a 100-year storm. Soils with residual COCs may impact the bay during high erosion storm events. **Figures 2-4** and **2-5** show projected areas of transient flooding due to storms projected in years 2035 and 2065, respectively.

Excavation remedies reduce heavy metals, PCBs and PAHs to their applicable RGs in accordance with each parcel's ROD. Because the land in many parcels at HPNS is relatively flat and all parcels have durable covers, either vegetative cover or asphalt cover, there is less likelihood of erosion-related impacts on underlying COCs. Of the two parcels expected to experience the most flooding, Parcel D-1 has asphalt cover throughout the parcel and Parcel E has a mix of asphalt cover and vegetative cover planned. In addition, parts of Parcel E-2 have a protective liner underneath the vegetative cover, to minimize water seeping into the soil with elevated COCs below. The parcels on the southern side of HPNS are lined with seawall and many of the parcels on the northern side have revetments, which will further reduce the impact of storm surges and waves. In addition, wetlands have been incorporated into Parcel E-2 and those will act to reduce storm surges and wave action as well. Therefore, for multiple reasons, the parcels at HPNS are resilient to this potential exposure scenario.

5.3.6 Parcel E-2 Remedy Resiliency

The Parcel E-2 remedy, currently under construction, incorporates remedy design features that make it resilient to climate impacts and protective of the bay. The Parcel E-2 tidal and freshwater wetlands (under construction) are projected to flood in 2035 and 2065; however, the wetlands were designed to store and transmit seawater, rain, and groundwater to mitigate the effects of SLR in accordance with the RD (ERRG, 2014a). Power interruptions from extreme weather events could temporarily impact the LFG system that requires power, but a few days of interruption is not likely to affect the overall gas collection system efficiency. Also, the LFG system is now solar powered.

The following design elements have made the E-2 remedy resilient:

- Excavation and offsite disposal of hotspots

- Grading and onsite consolidation of soil, sediment, and debris. Shoreline revetment (9 feet high) and seawall (additional 3 feet)
- Tidal and freshwater wetlands installed to mitigate the daily influence of tides and periodic influence of waves during storms
- Excavation and shipping out of radiological COCs, removal of sanitary sewers, storm drains, septic and sewer lines
- Landfill cap consisting of 2-foot-thick foundation soil layer, a protective geo-composite liner with drainage layer, and a minimum 2-foot-thick vegetative soil cover
- Groundwater controls, including downgradient slurry wall (keyed into aquitard), upgradient slurry wall, French drain upgradient to divert groundwater around the landfill, and monitoring wells around the landfill that are regularly monitored. Downgradient groundwater monitoring wells so far have not shown exceedances of applicable risk thresholds for any of the COCs monitored.
- LFG controls, including an active collection and treatment system to control LFG emissions and migration
- Regular maintenance, monitoring, and institutional controls, including
  - Cover integrity inspections
  - Groundwater and LFG monitoring
  - Stormwater and erosion controls
  - Wetlands monitoring and maintenance
  - Inspections after a qualifying event (earthquake, storm event, or system alarm)
  - Prompt repairs to any damage observed during routine and event-triggered inspections

The revetment is designed to withstand a 100-year storm and the addition of the seawall makes the landfill resilient to projected SLR through year 2065 (3.2 feet projected SLR highest GHG scenario). Drainage channels, culvert, and outfall structures around the landfill are designed to accommodate peak flows from a 1,000-year storm (ERRG, 2014a). Any damage to the system would be promptly repaired to comply with the operations and maintenance plan. Although the Parcel E-2 remedy components such as the sea wall were designed for resilience through a 3-foot rise in sea level (similar to the 2065 scenario), a site-specific study is recommended to evaluate the longer-term scenarios (such as in the year 2100).

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6.0 Conclusions and Recommendations

The following section discusses the conclusions and recommendations of the screening-level CRA.

6.1 Conclusions

The CRA concluded that the past and ongoing remedies implemented by the Navy have made the parcels at HPNS resilient to most impacts projected to result from the climate change hazards identified by DCAT. The vulnerabilities to climate change identified in this CRA include the following:

- In 2035, a potential vulnerability to human receptors and San Francisco Bay receptors from heavy metals and low-level radiological objects to permanent groundwater emergence at Parcels D-1 and E-2.
- In 2065, potential vulnerability to human receptors and San Francisco Bay receptors from heavy metals because of permanent groundwater emergence at IR-07/18, Parcels B-1, B-2, C, D-1, E, and E-2.

CRA Recommendations in the Five-Year Review

If a vulnerability is projected to result in a potentially new exposure scenario for either human or ecological receptors, then further IR site-specific study is recommended to evaluate whether there may be additional CERCLA risk as a result of the vulnerability. The findings for this CRA are as follows:

- Based on 2035 SLR projections, an IR site-specific study is recommended to assess whether the projected climate change vulnerabilities are likely to result in additional CERCLA risk at wetland areas in Parcels D-1 and E-2.
- Based on 2065 SLR projections, IR site-specific studies are recommended to assess whether the projected climate change vulnerabilities are likely to result in additional CERCLA risk at IR-07/18 and at wetland areas in Parcels B-1, B-2, C, D-1, E, and E-2.

For future Five-Year Reviews, the following are recommended to assess the impact of the projected vulnerabilities identified in this CRA:

- **Verification of HPNS SLR and Groundwater Emergence Projections:** SLR projections can be verified by tracking the five tide gauges nearest to HPNS. The DCAT guides users to a sea level tracker developed by USACE (USACE, 2023), where SLR measurements in tide gauges can be plotted against a 19-year moving average that accounts for normal fluctuations over one tidal cycle. Groundwater emergence projections will be verified by validating monitoring well construction data and ground elevations.
- **Annual Evaluation of Groundwater Elevation Data:** Evaluate the impacts of SLR on groundwater elevations over time. Perform an annual evaluation to compare tidal gauge trends to shallow water table elevation trends.

The Navy framework for CRA (2024) recommends that climate impacts on protectiveness determinations can be better evaluated after detailed site-specific studies have been conducted to verify projected impacts and vulnerabilities identified in the screening-level CRA. The CRA is a screening-level assessment to identify potential vulnerabilities that can be further assessed in site-specific studies at HPNS. These site-specific studies and prioritization of parcels will be

discussed with the agencies. Protectiveness statements in a Five-Year Review will be affected when site-specific studies show that an exposure pathway has the potential to be complete and a future unacceptable health risk has been identified (data collected, validated, and evaluated following CERCLA risk assessment processes resulting in unacceptable risk to receptors). The Navy will assess year 2100 projections in conjunction with site-specific studies.

The CRA estimates that groundwater emergence may occur in several parcels by the year 2065. These mapping projections will be verified during site-specific studies. However, protectiveness is only affected when increased CERCLA risk attributable to climate hazards has been identified (groundwater is likely to emerge and land use is such that receptors could be exposed and a future unacceptable health or ecological risk has been identified, data collected, validated, and evaluated following CERCLA risk assessment processes resulting in unacceptable risk to receptors).

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Tables

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Table 1-1. Eight Climate Change-related Hazards Identified in Department of Defense Climate Assessment Tool

Continental U.S. Climate Hazard	Supporting Indicators
Drought	Flash drought frequency, drought year frequency, aridity, consecutive dry days, mean annual runoff
Coastal Flooding	Coastal flood extent, coastal erosion
Riverine Flooding	Riverine flood extent, flood magnification factor, maximum 1-day precipitation, maximum 5-day precipitation, extreme precipitation days
Heat	Days above 95 degrees Fahrenheit (°F), 5-day maximum temperature, high heat days, frost days, high heat Index days
Energy Demand	Heating degree days, cooling degree days, 5-day minimum temperature, 5-day maximum temperature
Land Degradation	Fire season length, aridity, soil loss, coastal erosion, permafrost hazard
Wildfire	Fuel abundance, ignition rate, fire season length, flash drought frequency
Historical Extreme Conditions	Tornado frequency, hurricane wind greater than 50 knots, hurricane maximum precipitation, hurricane frequency, ice storms, historic drought frequency, ice jams, wildland urban interface

°F = degree(s) Fahrenheit
DCAT = Department of Defense Climate Assessment Tool

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Table 2-1. Sea Level Rise Projections for 2035 and 2065 in Department of Defense Regional Sea Level Database

Global Greenhouse Gas Scenario	Site-specific Sea Level Rise Projections Including Vertical Land Movement	
	2035 (feet)	2065 (feet)
Lowest	0.3	0.6
Low	0.3	1.0
Medium	0.7	1.6
High	0.7	2.3
Highest	1.0	3.2

DRSL = Department of Defense Regional Sea Level Database
GHG = greenhous gas
SLR = sea level rise

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Table 2-2. Impacts of Coastal Flooding in Parcels by 2035

Parcel	Impacted by Groundwater Emergence	Impacted by 100-year Storm	Impacted by Groundwater Table Rise to 3-feet Below Ground Surface
IR-07/18	No	Yes. IR-07/18	No
B-1	No	Yes. IR-10, IR-23, IR-24, IR-60, and IR-61	Yes IR-20 and IR-62
B-2	No	Yes. IR-24 and IR-26	Yes IR-26
C	No	Yes. IR-27, IR-28, IR-29, IR-57, and IR-64	Yes IR-25 and IR-28
D-1	Yes	Yes. IR-17, 55, 68, 70	Yes IR-70
D-2	No	No	No
E	No	Yes. IR-2, IR-8, IR-13, IR-14, IR-36, IR-38, and IR-39	Yes IR-2, IR-8, IR-13, IR-36, and IR-39
E-2	Yes. Wetland areas	Yes. IR-1 and IR-21	No
G	No	No	Yes. IR-9, IR-33, IR-34, and IR-37
UC-1	No	No	No
UC-2	No	No	No
UC-3	No	No	No

bgs = below ground surface
IR = installation restoration

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Table 2-3. Impacts of Coastal Flooding in Parcels by 2065

Parcel	Impacted by Groundwater Emergence	Impacted by 100-year Storm	Impacted by Groundwater Table Rise to 3-feet Below Ground Surface
IR-07/18	Yes. IR-07/18	Yes. IR-07/18	Yes. IR-07/18
B-1	Yes. IR 23, 24, 60	Yes. IR 10, 23, 24, 60, 61	Yes. IR 10, 20, 62
B-2	Yes. IR 26	Yes. IR 26	Yes. IR 26
C	Yes. IR 27, 28, 57	Yes. IR 27, 28, 29, 30, 57, 58, 63, 64	Yes. IR 25, 28
D-1	Yes. IR 17, 53, 68, 69	Yes. IR 16, 17, 22, 35, 48, 53, 55, 68, 69, 70	Yes. IR 22, 55, 70
D-2	No	Yes. Small portion along boundary.	No
E	Yes. IR 2, 38, 39	Yes. IR 2, 3, 5, 8, 11, 12, 13, 14, 36, 38, 39, 73	Yes. IR 2, 4, 8, 13, 14, 15, 36, 39
E-2	Yes. IR 1/21, Wetland areas	Yes. IR 1/21	Yes. IR 1/21
G	No	Yes. IR 9, 33, 34, 37, 44, 65, 66, 67, 71	Yes. IR 9, 33, 34, 37
UC-1	No	Yes	No
UC-2	No	Yes	No
UC-3	No	No	No

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Table 4-1. Impacts of Other Climate Hazards (Other than Coastal Flooding)

Parcel	Extreme Weather Events (Rain Storms)	Drought	Wildfires	Riverine Flooding	Extreme Temperatures	Energy Demand	Land Degradation
All Parcels (except E-2)	Yes	Yes	Yes	No	No	No	No
E-2	Yes	Yes	Yes	No	No	Yes	No

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Table 5-1. Resilience of Parcels to Coastal Flooding Impacts in 2035

Parcel	Impacted By Groundwater Emergence	Impacted by 100-year Storm	Impacted by Groundwater Table Rise to 3-feet Below Ground Surface (bgs)	Potential New Exposure to Chlorinated Volatile Organic Compounds from Vapor Intrusion due to Groundwater Table Rise of 3-feet bgs	Potential New Exposure of Human Receptors at the Ground Surface to Heavy Metals due to Groundwater Emergence	Potential New Exposure of Ecological Receptors in the Bay to Heavy Metals due to Groundwater Emergence	Potential New Exposure of Subsurface Remedy Infrastructure to Saltwater Intrusion	Potential New Exposureof Human Receptors to Heavy Metals from Erosion due to Storm Surges
IR-07/18	No	Yes. IR-07/18	No	No	No	No	No	No
B-1	No	Yes. IR 10, 23, 24, 60, 61	Yes. IR 20, 62	No	No	No	No	No
B-2	No	Yes. IR 24, 26	Yes. IR 26	No	No	No	No	No
C	No	Yes. IR 27, 28, 29, 57, 64	Yes. IR 25, 28	No	No	No	No	No
D-1	Yes. (outside of IR boundary)	Yes. IR 17, 55, 68, 70	Yes. IR 70	No	Yes	Yes	No	No
D-2	No	No	No	No	No	No	No	No
E	No	Yes. IR 2, 8, 13, 14, 36, 38, 39	Yes. IR 2, 8, 13, 36, 39	No	No	No	No	No
E-2	Yes. Wetland areas	Yes. IR 1/21	No	No	No	No	No. LFG extraction wells and collection trench above groundwater table rise	No

Table 5-1. Resilience of Parcels to Coastal Flooding Impacts in 2035

Parcel	Impacted By Groundwater Emergence	Impacted by 100-year Storm	Impacted by Groundwater Table Rise to 3-feet Below Ground Surface (bgs)	Potential New Exposure to Chlorinated Volatile Organic Compounds from Vapor Intrusion due to Groundwater Table Rise of 3-feet bgs	Potential New Exposure of Human Receptors at the Ground Surface to Heavy Metals due to Groundwater Emergence	Potential New Exposure of Ecological Receptors in the Bay to Heavy Metals due to Groundwater Emergence	Potential New Exposure of Subsurface Remedy Infrastructure to Saltwater Intrusion	Potential New Exposureof Human Receptors to Heavy Metals from Erosion due to Storm Surges
G	No	No	Yes. IR 9, 33, 34, 37	No	No	No	No	No
UC-1	No	No	No	No	No	No	No	No
UC-2	No	No	No	No	No	No	No	No
UC-3	No	No	No	No	No	No	No	No

CVOC = chlorinated volatile organic compound
LFG = landfill gas

Table 5-2. Resilience of Parcels to Coastal Flooding Impacts in 2065

Parcel	Impacted by Groundwater Emergence	Impacted by 100-year Storm	Impacted by Groundwater Table Rise to 3-feet Below Ground Surface (bgs)	Potential New Exposure to Chlorinated Volatile Organic Compounds from Vapor Intrusion due to Groundwater Table Rise of 3-feet bgs	Potential New Exposure of Human Receptors at the Ground Surface to Heavy Metals due to Groundwater Emergence	Potential New Exposure of Ecological Receptors in the Bay to Heavy Metals due to Groundwater Emergence	Potential New Exposure of Subsurface Remedy Infrastructure to Saltwater Intrusion	Potential New Exposureof Human Receptors to Heavy Metals from Erosion due to Storm Surges
IR-07/18	Yes. IR-07/18	Yes. IR-07/18	Yes. IR-07/18	No	Yes. (in areas with asphalt cover)	Yes. (in areas with asphalt cover)	No	No
B-1	Yes. IR 23, 24, 60	Yes. IR 10, 23, 24, 60, 61	Yes. IR 10, 20, 62	No	Yes. (in areas with asphalt cover)	Yes. (in areas with asphalt cover)	No	No
B-2	Yes. IR 26	Yes. IR 26	Yes. IR 26	No	Yes	Yes	No	No
C	Yes. IR 27, 28, 57	Yes. IR 27, 28, 29, 30, 57, 58, 63, 64	Yes. IR 25, 28	No	Yes	Yes	No	No
D-1	Yes. IR 17, 53, 68, 69	Yes. IR 16, 17, 22, 35, 48, 53, 55, 68, 69, 70	Yes. IR 22, 55, 70	No	Yes	Yes	No	No
D-2	No	Yes. Small portion of boundary.	No	No	No	No	No	No
E	Yes. IR 2, 38, 39	Yes. IR 2, 3, 5, 8, 11, 12, 13, 14, 36, 38, 39, 73	Yes. IR 2, 4, 8, 13, 14, 15, 36, 39	No	Yes. (in areas with asphalt cover)	Yes. (in areas with asphalt cover)	No	No

Table 5-2. Resilience of Parcels to Coastal Flooding Impacts in 2065

Parcel	Impacted by Groundwater Emergence	Impacted by 100-year Storm	Impacted by Groundwater Table Rise to 3-feet Below Ground Surface (bgs)	Potential New Exposure to Chlorinated Volatile Organic Compounds from Vapor Intrusion due to Groundwater Table Rise of 3-feet bgs	Potential New Exposure of Human Receptors at the Ground Surface to Heavy Metals due to Groundwater Emergence	Potential New Exposure of Ecological Receptors in the Bay to Heavy Metals due to Groundwater Emergence	Potential New Exposure of Subsurface Remedy Infrastructure to Saltwater Intrusion	Potential New Exposureof Human Receptors to Heavy Metals from Erosion due to Storm Surges
E-2	Yes. IR 1/21, Wetland areas	Yes. IR 1/21	Yes. IR 1/21	No	No	No	No	No
G	No	Yes. IR 9, 33, 34, 37, 44, 65, 66, 67, 71	Yes. IR 9, 33, 34, 37	No	No	No	No	No
UC-1	No	Yes	No	No	No	No	No	No
UC-2	No	Yes	No	No	No	No	No	No
UC-3	No	No	No	No	No	No	No	No

Table 5-3. Resilience of Parcels to Other Climate Hazards

Parcel	Potential New Exposure of Human Receptors to Heavy Metals from Erosion due to Rain Storms	Potential New Exposure from Vapor Intrusion due to a Drop in Groundwater Table During Drought	Potential New Concern due to Wildfires	Potential New Concern due to Inability to Meet Energy Demand During Power Outage	Potential New Concern due to Land Degradation
IR-07/18	No	No	No	No	No
B-1	No	No	No	No	No
B-2	No	No	No	No	No
C	No	No	No	No	No
D-1	No	No	No	No	No
D-2	No	No	No	No	No
E	No	No	No	No	No
E-2	No	No	No	No	No
G	No	No	No	No	No
UC-1	No	No	No	No	No
UC-2	No	No	No	No	No
UC-3	No	No	No	No	No

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Figures

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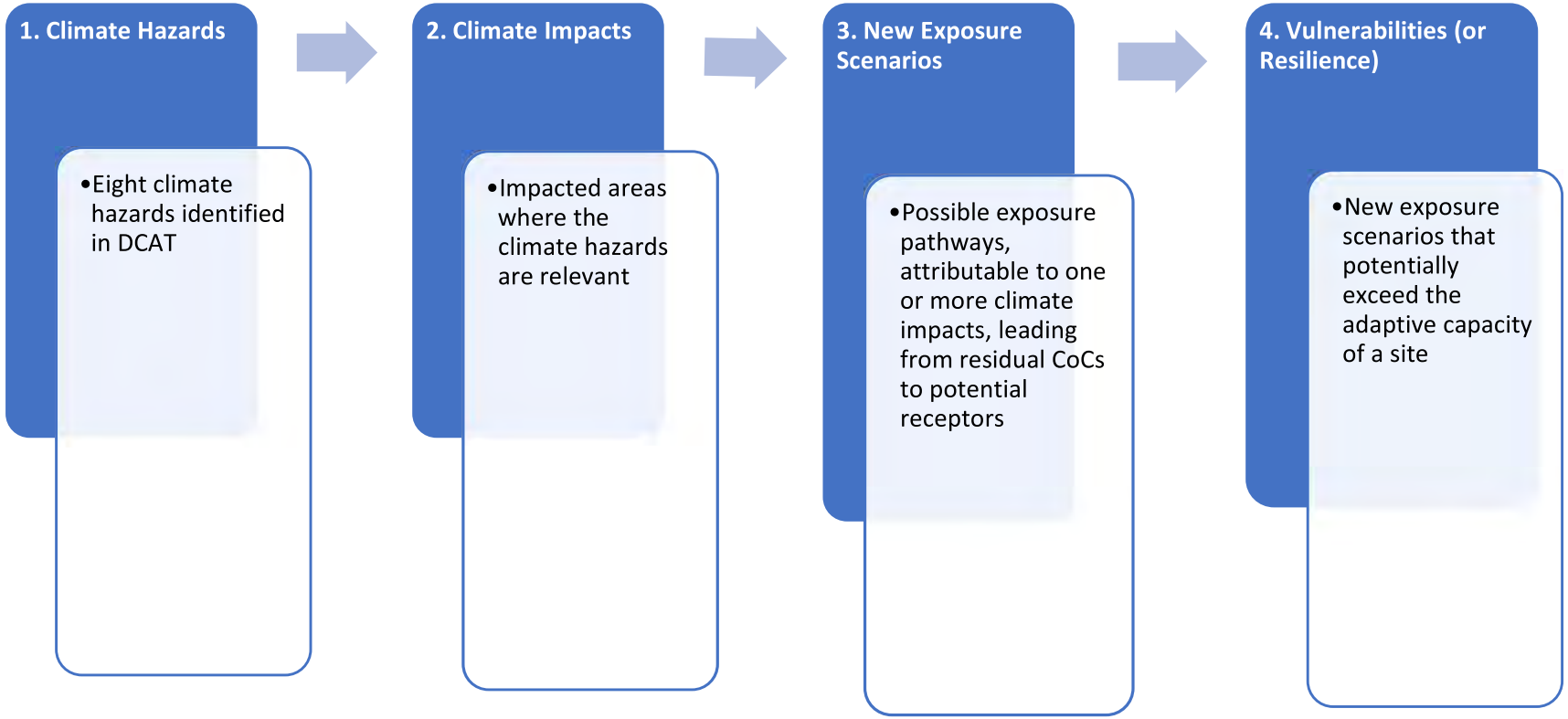

Figure 1-1. Steps in the CRA leading from climate-related hazards to identification of potential vulnerabilities or resilience

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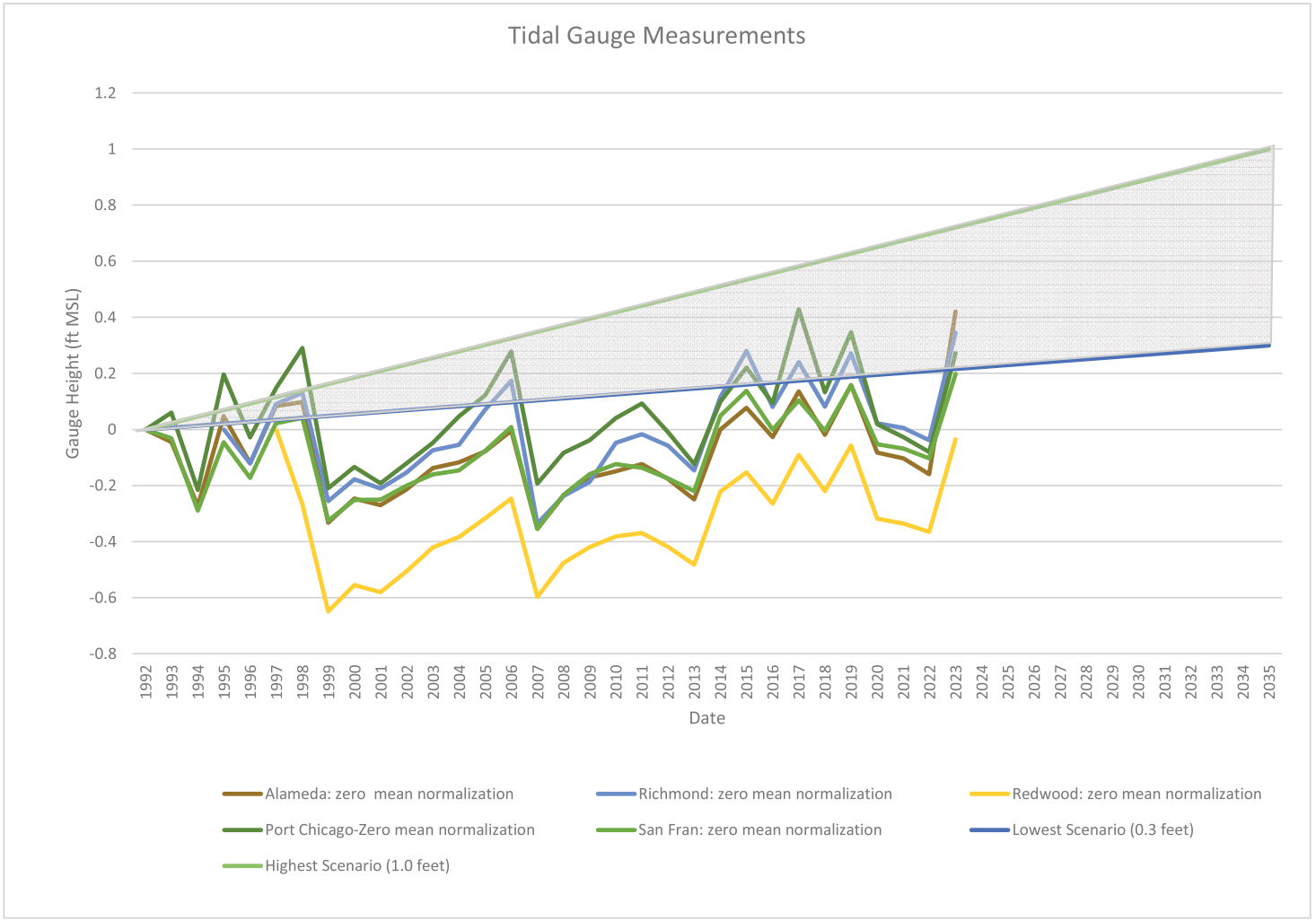

Figure 2-1
Actual Sea Level Rise Measurements in Five Tidal Gauges Nearest to Former Hunters Point Naval Shipyard Compared to DRSL Projected Range to Year 2035

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Parcels

- B-1
- B-2
- C
- D-1
- D-2
- E
- E-2
- F (Pier)
- F (Water)
- G
- IR 7/18
- UC-1
- UC-2
- UC-3

Features

- Permanent Inundation due to sea level rise only
- Berms
- Seawall_12ft

Global GHG Scenarios 2035
Permanent Inundation
due to Sea Level Rise
Highest GHG: 1.0 feet above MSL
Figure 2-2

N
W E
S

0 0.07 0.15 0.3 0.45 0.6 Miles

Spatial Reference
Name: GCS WGS 1984
GCS: GCS WGS 1984
Datum: WGS 1984
Map Units: Degree

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Parcels

- B-1
- B-2
- C
- D-1
- D-2
- E
- E-2
- F (Pier)
- F (Water)
- G
- IR 7/18
- UC-1
- UC-2
- UC-3

Features

- Permanent Inundation due to sea level rise only
- Berms
- Seawall_12ft

Global GHG Scenarios 2065
Permanent Inundation
due to Sea Level Rise
Highest GHG: 3.2 feet above MSL
Figure 2-3

N
W E
S

0 0.07 0.15 0.3 0.45 0.6
Miles

Spatial Reference
Name: GCS WGS 1984
GCS: GCS WGS 1984
Datum: WGS 1984
Map Units: Degree

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Parcels

- B-1
- B-2
- C
- D-1
- D-2
- E
- E-2
- F (Pier)
- F (Water)
- G
- IR 7/18
- UC-1
- UC-2
- UC-3

Features

- Transient Inundation
- Berms
- Seawall_12ft

Global GHG Scenarios 2035
Transient Inundation
100-Year Storm Event Projection
Highest GHG: 1.0 feet above MSL
Figure 2-4

N
W E
S

0 0.07 0.15 0.3 0.45 0.6 Miles

Spatial Reference
Name: GCS WGS 1984
GCS: GCS WGS 1984
Datum: WGS 1984
Map Units: Degree

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Parcels

- B-1
- B-2
- C
- D-1
- D-2
- E
- E-2
- F (Pier)
- F (Water)
- G
- IR 7/18
- UC-1
- UC-2
- UC-3

Features

- Transient Inundation
- Berms
- Seawall_12ft

Global GHG Scenarios 2065
Transient Inundation
100-Year Storm Event Projection
Highest GHG: 3.2 feet above MSL
Figure 2-5

N
W E
S

0 0.07 0.15 0.3 0.45 0.6 Miles

Spatial Reference
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GCS: GCS WGS 1984
Datum: WGS 1984
Map Units: Degree

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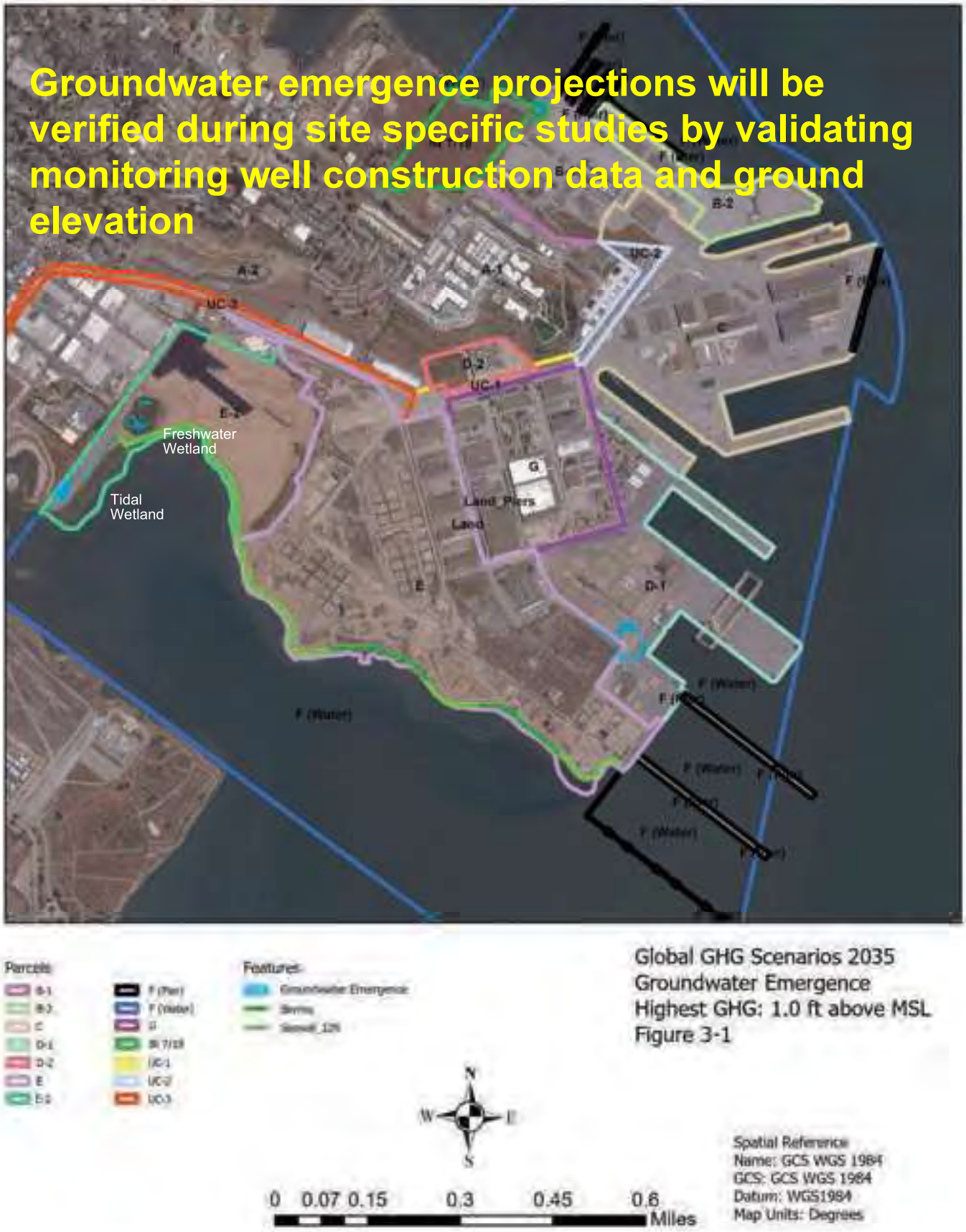
Groundwater emergence projections will be verified during site specific studies by validating monitoring well construction data and ground elevation
Freshwater Wetland
Tidal Wetland
Parcels
Features
Global GHG Scenarios 2035
Groundwater Emergence
Highest GHG: 1.0 ft above MSL
Figure 3-1
N
W
E
S
0 0.07 0.15 0.3 0.45 0.6
Miles
Spatial Reference
Name: GCS WGS 1984
GCS: GCS WGS 1984
Datum: WGS1984
Map Units: Degrees

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Groundwater emergence projections will be verified during site specific studies by validating monitoring well construction data and ground elevation
Freshwater Wetland
Tidal Wetland
Parcels
Features
Global GHG Scenarios 2065
Groundwater Emergence
Highest GHG: 3.2 ft above MSL
Figure 3-2
N
W
E
S
0 0.07 0.15 0.3 0.45 0.6
Miles
Spatial Reference
Name: GCS WGS 1984
GCS: GCS WGS 1984
Datum: WGS1984
Map Units: Degrees

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Groundwater table rise projections will be verified during site specific studies by validating monitoring well construction data and ground elevation
Parcels
Features
Global GHG Scenarios 2035
Groundwater Table Rise to 3 ft bgs
Highest GHG: 1.0 ft above MSL
Figure 3-3
N
W
E
S
0 0.07 0.15 0.3 0.45 0.6
Miles
Spatial Reference
Name: GCS WGS 1984
GCS: GCS WGS 1984
Datum: WGS1984
Map Units: Degrees

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Groundwater table rise projections will be verified during site specific studies by validating monitoring well construction data and ground elevation
Parcels
B-1
B-2
C
D-1
D-2
E
E-2
F (Pier)
F (Water)
G
IR 7/18
UC-1
UC-2
UC-3
Features
Well locations where groundwater is projected to be less than 3 feet below ground surface
Berms
Seawall_12ft
Global GHG Scenarios 2065
Groundwater Table Rise to 3 ft bgs
Highest GHG: 3.2 ft above MSL
Figure 3-4
N
W
E
S
0 0.07 0.15 0.3 0.45 0.6
Miles
Spatial Reference
Name: GCS WGS 1984
GCS: GCS WGS 1984
Datum: WGS1984
Map Units: Degrees

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Appendix B
Interview Summaries

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INTERVIEW RECORD		
Site Name: Hunters Point Naval Shipyard		**EPA ID No.:** CA1170090087
Subject: Five-Year Review O&M Interview		**Date:** 2/7/2023
Type: Telephone Visit Other **Location of Visit:** Questions and responses provided via e-mail.		
Contact Made By:		
Name: Jamie Egan	**Title:** Project Manager	**Organization:** CH2M HILL
Individual Contacted:		
Name: Lou Ehrhard	**Title:** Project Manager	**Organization:** Kemron
E-Mail Address: lehrhard@kemron.com		

Summary Of Conversation

1. What is your affiliation with the Former Hunter's Point Naval Shipyard and what is your role in regard to the oversight of any of the Five Year Review sites/parcels? The sites are as follows:

- Installation Restoration [IR] Sites 7 and 18
- Parcel B-1
- Parcel B-2
- Parcel C
- Parcel D-1
- Parcel D-2
- Parcel E
- Parcel E-2
- Parcel F (Final ROD pending)
- Parcel UC-1
- Parcel UC-2
- Parcel UC-3

Project Manager for the Parcel E-2, Phase III scope, consisting of construction of the landfill cap over the main portion of the existing landfill and installation of the gas control and containment system. I am responsible for the implementation of the Phase III construction scope as well as preparation of plans and reports, including O&M Plans.

2. Over the past five years, have you been involved in on-going communication with the Navy in regard to the Navy's environmental activities at any of the Five-Year Review sites?

Yes, we have weekly calls with the Navy to discuss the scope and progress of the construction at Parcel E-2.

3. Is there an on-site O&M Presence at any of the Five-Year Review sites? Please describe staff O&M activities and their frequency.

As part of our scope, we had a requirement to inspect the revetment wall at Parcel E-2 constructed by others. Two years of inspections were performed, on a quarterly basis in 2020 and on a semiannual basis in 2021, and this scope has been completed.

4. Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines since the start-up or in the last five years at any of the Five-Year Review sites? Please describe and include whether they affect the protectiveness of the remedy.

No, as the landfill cap and gas control and containment system remedy has not yet been completed O&M of the landfill cap at Parcel E-2 has not started.

5. Have there been unexpected O&M difficulties or changes in costs since start-up or in the last five years at any of the Five-Year Review sites? If so, please give details.

No.

6. Have there been opportunities to optimize O&M or sampling efforts at any of the Five-Year Review sites? Please describe changes and results or improved efficiency?

No, O&M for the Parcel E-2 landfill cover has not yet started.

INTERVIEW RECORD		
Site Name: Hunters Point Naval Shipyard		**EPA ID No.:** CA1170090087
Subject: Five-Year Review O&M Interview		**Date:** 2/7/2023
Type: Telephone Visit Other **Location of Visit:** Questions and responses provided via e-mail.		
Contact Made By:		
Name: Jamie Egan	**Title:** Project Manager	**Organization:** CH2M HILL
Individual Contacted:		
Name: Brett Womack	**Title:** Project Manager	**Organization:** GES-AIS
E-Mail Address: bwomack@ges-ais.com		

Summary Of Conversation

1. What is your affiliation with the Former Hunter's Point Naval Shipyard and what is your role in regard to the oversight of any of the Five Year Review sites/parcels? The sites are as follows:

- Installation Restoration [IR] Sites 7 and 18
- Parcel B-1 – ***Radiological Rework Contractor (active)***
- Parcel B-2 – ***Radiological Rework Contractor (active)***
- Parcel C – ***Radiological Rework Contractor (active)***
- Parcel D-1 – ***RCA Operator – RSY pads (active)***
- Parcel D-2 – ***Radiological Rework Contractor (not active)***
- Parcel E – ***RA Contractor, Phase 2 (active)***
- Parcel E-2
- Parcel F (Final ROD pending)
- Parcel UC-1 – ***Radiological Rework Contractor (not active)***
- Parcel UC-2 – ***Radiological Rework Contractor (not active)***
- Parcel UC-3 – ***Radiological Rework Contractor (not active)***

2. Over the past five years, have you been involved in on-going communication with the Navy in regard to the Navy's environmental activities at any of the Five-Year Review sites?

Yes.

3. Is there an on-site O&M Presence at any of the Five-Year Review sites? Please describe staff O&M activities and their frequency.

GES has no O&M presence beyond requirements on active work sites. Active mowing/vegetation control and swale maintenance is performed by ERRG.

4. Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines since the start-up or in the last five years at any of the Five-Year Review sites? Please describe and include whether they affect the protectiveness of the remedy.

No change to my knowledge.

5. Have there been unexpected O&M difficulties or changes in costs since start-up or in the last five years at any of the Five-Year Review sites? If so, please give details.

Unaware.

6. Have there been opportunities to optimize O&M or sampling efforts at any of the Five-Year Review sites? Please describe changes and results or improved efficiency?

Unaware.

INTERVIEW RECORD		
Site Name: Hunters Point Naval Shipyard		**EPA ID No.:** CA1170090087
Subject: Five-Year Review O&M Interview		**Date:** 2/20/2023
Type: Telephone Visit Other **Location of Visit:** Questions and responses provided via e-mail.		
Contact Made By:		
Name: Jamie Egan	**Title:** Project Manager	**Organization:** CH2M HILL
Individual Contacted:		
Name: Doug Delong	**Title:** CSO Facility/ Compliance Project Manager	**Organization:** NAVFAC BRAC
E-Mail Address: douglas.e.delong.ctr@us.navy.mil		

Summary Of Conversation

1. What is your affiliation with the Former Hunter's Point Naval Shipyard and what is your role in regard to the oversight of any of the Five Year Review sites/parcels? The sites are as follows:

- Installation Restoration [IR] Sites 7 and 18
- Parcel B-1
- Parcel B-2
- Parcel C
- Parcel D-1
- Parcel D-2
- Parcel E
- Parcel E-2
- Parcel F (Final ROD pending)
- Parcel UC-1
- Parcel UC-2
- Parcel UC-3

I am the BRAC PMO-W's Caretaker Site Office (CSO) Facility/Compliance Project Manager. Our RPM team work[s] out of San Diego & the CSO team works out of the Treasure Island office. I provide the daily access, coordination to all the parcels on HPS as well as review & coordination of the waste manifests generated.

2. Over the past five years, have you been involved in on-going communication with the Navy in regard to the Navy's environmental activities at any of the Five-Year Review sites?

As a member of the BRAC-PMO staff, I work with the Navy on a daily basis, all day, every year. I attend & contribute at the weekly QC meetings.

3. Is there an on-site O&M Presence at any of the Five-Year Review sites? Please describe staff O&M activities and their frequency.

We have a contract to various contractors, to maintain ongoing O&M issues at all the parcels. The current contractors doing ongoing operations within them (i.e., APTIM, GES) maintain the Parcels and as issues arise, they are dealt with, on an as needed base. I.e. daily fence breaches or scheduled, sampling wells.

4. Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines since the start-up or in the last five years at any of the Five-Year Review sites? Please describe and include whether they affect the protectiveness of the remedy.

No significant changes to the five-year- O&M requirements other that what is approved by the signature authorities & contracts

5. Have there been unexpected O&M difficulties or changes in costs since start-up or in the last five years at any of the Five-Year Review sites? If so, please give details.

No unexpected O&M difficulties or changes that I am aware of.

6. Have there been opportunities to optimize O&M or sampling efforts at any of the Five-Year Review sites? Please describe changes and results or improved efficiency?

From time-to-time when we have another contractor requiring access to a parcel, we have the prime contractor, work with the sub, so both parties can continue their requirements without interfering with one another (i.e., working different hours or a different location within the parcel so both have access)

Appendix C
Site Inspection and Photograph Logs

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Five-Year Review Site Inspection Checklist

I. SITE INFORMATION	
Site name: Installation Restoration Site 07 and 18	**Date of inspection:** 2/9/2023
Location and Region: Hunters Point Naval Shipyard San Francisco, CA, Region 9	**EPA ID:** CA1170090087
Agency, office, or company leading the five-year review: Department of the Navy	**Weather/temperature:** Sunny, 50s

Remedy Includes: (Check all that apply)

☐ Landfill cover/containment
☒ Monitored natural attenuation
☐ Access controls
☐ Groundwater containment
☒ Institutional controls
☐ Vertical barrier walls
☐ Groundwater pump and treatment
☐ Surface water collection and treatment
☒ Other Durable cover consisting of a soil cover, shoreline revetment (riprap), asphaltic concrete pavement

Attachments: ☐ Inspection team roster attached ☒ Site map attached

II. INTERVIEWS (Interviews Conducted Separately)

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

☒ O&M manual	☒ Readily available	☐ Up to date	☐Not applicable (N/A)
☒ As-built drawings	☒ Readily available	☐ Up to date	☐ N/A
☐ Maintenance logs	☐ Readily available	☐ Up to date	☒ N/A

Remarks Documents available in the Administrative Record and O&M contractors' offices.

2. **Site-Specific Health and Safety Plan**

☐ Readily available ☐ Up to date ☒ N/A
☐ Contingency plan/emergency response plan ☐ Readily available ☐ Up to date ☒ N/A
Remarks_____

3. **O&M and OSHA Training Records** ☐ Readily available ☐ Up to date ☐ N/A
Remarks_____

4. **Permits and Service Agreements**

☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A
☐ Effluent discharge	☐ Readily available	☐ Up to date	☒ N/A
☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A
☐ Other permits_____	☐ Readily available	☐ Up to date	☒ N/A

Remarks_____

5.	**Gas Generation Records** ☐ Readily available ☐ Up to date ☒ N/A Remarks Soil gas monitoring is not required as documented in 2012 Operations and Maintenance Plan.[1]	
6.	**Settlement Monument Records** ☒ Readily available ☐ Up to date ☐ N/A Remarks	
7.	**Groundwater Monitoring Records** ☒ Readily available ☐ Up to date ☐ N/A Remarks: Groundwater monitoring is reported in annual Basewide groundwater monitoring reports.	
8.	**Leachate Extraction Records** ☐ Readily available ☐ Up to date ☒ N/A Remarks	
9.	**Discharge Compliance Records** ☐ Air ☐ Readily available ☐ Up to date ☒ N/A ☐ Water (effluent) ☐ Readily available ☐ Up to date ☒ N/A Remarks	
10.	**Daily Access/Security Logs** ☐ Readily available ☐ Up to date ☒ N/A Remarks: Guarded security gates at Robinson Street and Crisp Road restrict access to Hunters Point Naval Shipyard. City of San Francisco provides security and maintains access logs.	
IV. O&M COSTS (Not Applicable for Site Inspection)		
V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A		
A. Fencing		
1.	**Fencing damaged** ☐ Location shown on site map ☒ Gates secured ☐ N/A Remarks Fencing in good condition.	
B. Other Access Restrictions		
1.	**Signs and other security measures** ☒ Location shown on site map ☐ N/A Remarks Signs in generally good condition, some fading evident (Photograph 13).	
C. Institutional Controls (ICs)		

[1] ERRG. 2012. *Annual Operation and Maintenance Summary Report for Installation Restoration Sites 07 and 18 in Parcel B, Hunters Point Naval Shipyard, San Francisco, California*. October 4.

1.	**Implementation and enforcement** Site conditions imply ICs not properly implemented ☐ Yes ☒ No ☐ N/A Site conditions imply ICs not being fully enforced ☐ Yes ☒ No ☐ N/A Type of monitoring (*e.g.*, self-reporting, drive by) Routine Inspection Frequency Annually Responsible party/agency Navy and Navy O&M Contractors (Aptim Federal Services) Reporting is up-to-date ☒ Yes ☐ No ☐ N/A Reports are verified by the lead agency ☒ Yes ☐ No ☐ N/A Specific requirements in deed or decision documents have been met ☒ Yes ☐ No ☐ N/A Violations have been reported ☐ Yes ☐ No ☒ N/A Other problems or suggestions: ☐ Report attached None
2.	**Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A Remarks No evidence of unauthorized intrusive activities or incompatible land uses.
D. General	
1.	**Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident Remarks_____
2.	**Land use changes on site** ☒ N/A Remarks_____
3.	**Land use changes off site** ☒ N/A Remarks_____
VI. GENERAL SITE CONDITIONS	
A. Roads ☐ Applicable ☐ N/A	
1.	**Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A Remarks_____
B. Other Site Conditions	
	Remarks Some weeds growing near the retainment wall.
VII. LANDFILL COVERS ☒ Applicable ☐ N/A Note that the durable covers onsite are not engineered landfill covers.	
A. Landfill Surface	
1.	**Settlement** (Low spots) ☐ Location shown on site map ☒ Settlement not evident Areal extent_____ Depth_____ Remarks_____
2.	**Cracks** ☐ Location shown on site map ☒ Cracking not evident Lengths_____ Widths_____ Depths_____ Remarks_____

3.	**Erosion** Areal extent_____ Remarks_____	☐ Location shown on site map ☒ Erosion not evident Depth_____
4.	**Holes** Areal extent_____ Remarks_____	☐ Location shown on site map ☒ Holes not evident Depth_____
5.	**Vegetative Cover** ☐ Trees/Shrubs (indicate size and locations on a diagram) Remarks Some minor areas of stressed vegetation from vehicles (Photograph 7) and a small hole in the vegetated cover (Photograph 11).	☒ Grass ☒ Cover properly established ☐ No signs of stress
6.	**Alternative Cover (Shoreline Revetment)** Remarks Revetment in good condition, no signs of significant rock movement.	☐ N/A
7.	**Bulges** Remarks_____	☐ Location shown on site map ☒ Bulges not evident
8.	**Wet Areas/Water Damage** ☐ Wet areas ☐ Ponding ☐ Seeps ☐ Soft subgrade Remarks_____	☒ Wet areas/water damage not evident ☐ Location shown on site map Areal extent_____ ☐ Location shown on site map Areal extent_____ ☐ Location shown on site map Areal extent_____ ☐ Location shown on site map Areal extent_____
9.	**Slope Instability** ☐ Slides Remarks_____	☐ Location shown on site map ☒ No evidence of slope instability
B.	**Benches** (Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)	☐ Applicable ☒ N/A
C.	**Letdown Channels** (Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.) Remarks: Drainage channel along bump-out area north of Building 146 appears clear of heavy vegetation and in good condition.	☒ Applicable ☐ N/A
1.	**Settlement** Remarks_____	☐ Location shown on site map ☒ No evidence of settlement
2.	**Material Degradation** Remarks_____	☐ Location shown on site map ☒ No evidence of degradation
3.	**Erosion** Remarks_____	☐ Location shown on site map ☒ No evidence of erosion
4.	**Undercutting** Remarks_____	☐ Location shown on site map ☒ No evidence of undercutting

5.	**Obstructions** Type_____ ☒ No obstructions ☐ Location shown on site map Remarks_____
6.	**Excessive Vegetative Growth** Type_____ ☒ No evidence of excessive growth ☒ Vegetation in channels does not obstruct flow ☐ Location shown on site map Areal extent_____ Remarks Minor vegetation growth near retaining wall.
D. Cover Penetrations	☒ Applicable ☐ N/A
1.	**Gas Vents** ☐ Active ☐ Passive ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☒ N/A Remarks_____
2.	**Gas Monitoring Probes** ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☒ N/A Remarks_____
3.	**Monitoring Wells** (within surface area of landfill) ☒ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☒ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks None.
4.	**Leachate Extraction Wells** ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☒ N/A Remarks_____
5.	**Settlement Monuments** ☐ Located ☒ Routinely surveyed ☐ N/A Remarks Settlement Monument 2 in IR-07/18 is scheduled for surveying in 2024.
E. Gas Collection and Treatment	☐ Applicable ☒ N/A
F. Cover Drainage Layer	☐ Applicable ☒ N/A
G. Detention/Sedimentation Ponds	☐ Applicable ☒ N/A
H. Retaining Walls	☒ Applicable ☐ N/A
1.	**Deformations** ☐ Location shown on site map ☒ Deformation not evident Remarks_____
2.	**Degradation** ☐ Location shown on site map ☒ Degradation not evident Remarks_____
I. Perimeter Ditches/Off-Site Discharge	☒ Applicable ☐ N/A Remarks: Swales are located in IR-07/IR-18 and are in good shape.

1.	**Siltation** ☐ Location shown on site map ☒ Siltation not evident Remarks _____
2.	**Vegetative Growth** ☐ Location shown on site map ☐ N/A ☒ Vegetation does not impede flow Remarks _____
3.	**Erosion** ☐ Location shown on site map ☒ Erosion not evident Remarks None
4.	**Discharge Structure** ☒ Functioning ☐ N/A Remarks Drainage swale in good condition; check dam clear of debris.
	VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A
	IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A
A.	**Groundwater Extraction Wells, Pumps, and Pipelines** ☐ Applicable ☒ N/A
B.	**Surface Water Collection Structures, Pumps, and Pipelines** ☐ Applicable ☒ N/A
C.	**Treatment System** ☐ Applicable ☒ N/A
D.	**Monitoring Data**
1.	Monitoring Data ☒ Is routinely submitted on time ☒ Is of acceptable quality
2.	Monitoring data suggests: ☐ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining Remarks Chemicals of concern and radionuclides of concern have not exceeded trigger levels during this review period.
D.	**Monitored Natural Attenuation**
1.	**Monitoring Wells** (natural attenuation remedy) ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☒ Good condition ☐ All required wells located ☐ Needs Maintenance ☐ N/A Remarks Monitoring wells routinely inspected and maintained in Basewide groundwater monitoring program.
	X. OTHER REMEDIES - None
	XI. OVERALL OBSERVATIONS
A.	**Implementation of the Remedy**
	Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.). No issues observed related to implementation of the remedy (durable covers, ICs, groundwater monitoring) at IR-07/18.
B.	**Adequacy of O&M**

	Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. Review of O&M reports indicates that issues related to cover maintenance and vegetation are addressed promptly. Signs/fences reported in good condition.
C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future. None
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. None

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IR-07/18 Photograph 1: *Soil cover near revetment crest. Facing northwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

IR-07/18 Photograph 2: *Soil cover. Facing southwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

IR-07/18 Photograph 3: *Soil cover in southwest corner of site showing residential homes nearby. Facing southwest*
Photographed by: Marcella Navas/CH2M, 2/9/2023

IR-07/18 Photograph 4: *Soil cover northeast of Innes Avenue. Facing northeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

IR-07/18 Photograph 5: *Soil cover near entrance gate adjacent to Donahue Street. Facing northwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

IR-07/18 Photograph 6: *Soil cover southwest of revetment crest along non-Navy property. Facing southwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

IR-07/18 Photograph 7: *Vehicle tracks near intersection of Galvez Avenue and Donahue Street. Facing west.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

IR-07/18 Photograph 8: *Drainage channel with gravel patch southwest of Building 146. Facing northeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

IR-07/18 Photograph 9: *Retaining wall with vegetation growth. Facing southwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

IR-07/18 Photograph 10: *Shoreline revetment northwest of Building 146. Facing northwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

IR-07/18 Photograph 11: *View of shoreline revetment west of Building 144. Small hole in vegetated cover. Facing northwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

IR-07/18 Photograph 12: *Asphalt pavement at bump-out area north of Building 146 and vegetated drainage swale. Facing east.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

IR-07/18 Photograph 13: *Caution sign showing fading from Donahue Street northwest of Building 117. Facing northwest.*

Photographed by: Marcella Navas/CH2M, 2/9/2023

IR-07/18 Photograph 14: *Chain-link fence along Donahue Street. Facing northeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

IR-07/18 Photograph 15: *Chain-link fence along non-Navy property. Facing southwest.*

Photographed by: Marcella Navas/CH2M, 2/9/2023

IR-07/18 Photograph 16: *Monitoring well southwest of revetment crest. Facing northeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Five-Year Review Site Inspection Checklist

I. SITE INFORMATION	
Site name: Parcel B-1	**Date of inspection:** 2/9/23
Location and Region: Hunters Point Naval Shipyard San Francisco, CA, Region 9	**EPA ID:** CA1170090087
Agency, office, or company leading the five-year review: Department of the Navy	**Weather/temperature:** Sunny, 50s

Remedy Includes: (Check all that apply)

☐ Landfill cover/containment ☒ Monitored natural attenuation
☐ Access controls ☐ Groundwater containment
☒ Institutional controls ☐ Vertical barrier walls
☐ Groundwater pump and treatment
☐ Surface water collection and treatment
☒ Other Durable cover consisting of a soil cover, shoreline revetment (riprap), asphaltic concrete pavement, soil vapor extraction system at IR-10

Attachments: ☐ Inspection team roster attached ☒ Site map attached

II. INTERVIEWS (Interviews Conducted Separately)

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
   ☒ O&M manual ☒ Readily available ☐ Up to date ☐Not applicable (N/A)
   ☒ As-built drawings ☒ Readily available ☐ Up to date ☐ N/A
   ☐ Maintenance logs ☐ Readily available ☐ Up to date ☒ N/A
   Remarks Documents available in the Administrative Record and O&M contractors' offices.

2. **Site-Specific Health and Safety Plan**
   ☐ Readily available ☐ Up to date ☐ N/A
   ☐ Contingency plan/emergency response plan ☐ Readily available ☐ Up to date ☒ N/A
   Remarks

3. **O&M and OSHA Training Records** ☒ Readily available ☐ Up to date ☐ N/A
   Remarks

4. **Permits and Service Agreements**
   ☐ Air discharge permit ☐ Readily available ☐ Up to date ☒ N/A
   ☐ Effluent discharge ☐ Readily available ☐ Up to date ☒ N/A
   ☐ Waste disposal, POTW ☐ Readily available ☐ Up to date ☒ N/A
   ☐ Other permits_____ ☐ Readily available ☐ Up to date ☒ N/A
   Remarks

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ☒ N/A
   Remarks Soil vapor extraction system monitoring is discussed under Other Remedies.

6.	**Settlement Monument Records** ☒ Readily available ☐ Up to date ☐ N/A Remarks
7.	**Groundwater Monitoring Records** ☒ Readily available ☐ Up to date ☐ N/A Remarks: Groundwater monitoring is reported in annual Basewide groundwater monitoring reports.
8.	**Leachate Extraction Records** ☐ Readily available ☐ Up to date ☒ N/A Remarks
9.	**Discharge Compliance Records** ☐ Air ☐ Readily available ☐ Up to date ☒ N/A ☐ Water (effluent) ☐ Readily available ☐ Up to date ☒ N/A Remarks
10.	**Daily Access/Security Logs** ☐ Readily available ☐ Up to date ☒ N/A Remarks: Guarded security gates at Robinson Street and Crisp Road restrict access to Hunters Point Naval Shipyard. City of San Francisco provides security and maintains access logs.
	IV. O&M COSTS (Not Applicable for Site Inspection)
	V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A
A. Fencing	
1.	**Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☐ N/A Remarks Fencing in good condition.
B. Other Access Restrictions	
1.	**Signs and other security measures** ☐ Location shown on site map ☐ N/A Remarks Signs in generally good condition.
C. Institutional Controls (ICs)	
1.	**Implementation and enforcement** Site conditions imply ICs not properly implemented ☐ Yes ☒ No ☐ N/A Site conditions imply ICs not being fully enforced ☐ Yes ☒ No ☐ N/A Type of monitoring (*e.g.*, self-reporting, drive by) Routine Inspection Frequency Annually Responsible party/agency Navy and Navy O&M Contractors (Aptim Federal Services) Reporting is up-to-date ☒ Yes ☐ No ☐ N/A Reports are verified by the lead agency ☒ Yes ☐ No ☐ N/A Specific requirements in deed or decision documents have been met ☒ Yes ☐ No ☐ N/A Violations have been reported ☐ Yes ☐ No ☒ N/A Other problems or suggestions: ☐ Report attached None.
2.	**Adequacy** ☐ ICs are adequate ☐ ICs are inadequate ☐ N/A Remarks

D. General	
1.	**Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident Remarks
2.	**Land use changes on site** ☒ N/A Remarks
3.	**Land use changes off site** ☒ N/A Remarks
VI. GENERAL SITE CONDITIONS	
A. Roads ☒ Applicable ☐ N/A	
1.	**Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A Remarks Roads in good condition.
B. Other Site Conditions	
	Remarks Some debris accumulation in drainage ditch and protective riprap around outfalls.
VII. LANDFILL COVERS ☒ Applicable ☐ N/A Note that the durable covers onsite are not engineered landfill covers.	
A. Landfill Surface	
1.	**Settlement** (Low spots) ☐ Location shown on site map ☒ Settlement not evident Remarks
2.	**Cracks** ☐ Location shown on site map ☒ Cracking not evident Remarks If present, cracks are minor.
3.	**Erosion** ☒ Location shown on site map ☐ Erosion not evident Remarks Small areas of erosion observed southwest of Building 103 (Photograph 2).
4.	**Holes** ☐ Location shown on site map ☒ Holes not evident Remarks
5.	**Vegetative Cover** ☒ Grass ☒ Cover properly established ☐ No signs of stress ☐ Trees/Shrubs (indicate size and locations on a diagram) Remarks None
6.	**Alternative Cover (Shoreline Revetment)** ☐ N/A Remarks Revetment in good condition.
7.	**Bulges** ☐ Location shown on site map ☒ Bulges not evident Remarks None
8.	**Wet Areas/Water Damage** ☒ Wet areas/water damage not evident ☐ Wet areas ☐ Location shown on site map Areal extent_____ ☐ Ponding ☐ Location shown on site map Areal extent_____ ☐ Seeps ☐ Location shown on site map Areal extent_____ ☐ Soft subgrade ☐ Location shown on site map Areal extent_____ Remarks Drainage swale contained standing water but no depressions with standing water observed.

9.	**Slope Instability** ☐ Slides ☐ Location shown on site map ☒ No evidence of slope instability Remarks None
B. Benches	☐ Applicable ☒ N/A (Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)
C. Letdown Channels	☐ Applicable ☒ N/A (Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)
D. Cover Penetrations	☒ Applicable ☐ N/A
1.	**Gas Vents** ☐ Active ☐ Passive ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☒ N/A Remarks_____
2.	**Gas Monitoring Probes** ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☒ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks Soil vapor monitoring probes and system shut down and pending removal.
3.	**Monitoring Wells** (within surface area of landfill) ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks None
4.	**Leachate Extraction Wells** ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☒ N/A Remarks_____
5.	**Settlement Monuments** ☐ Located ☒ Routinely surveyed ☐ N/A Remarks Settlement Monument 1 is scheduled for surveying in 2024.
E. Gas Collection and Treatment	☐ Applicable ☒ N/A
F. Cover Drainage Layer	☐ Applicable ☒ N/A
G. Detention/Sedimentation Ponds	☐ Applicable ☒ N/A
H. Retaining Walls	☒ Applicable ☐ N/A
1.	**Deformations** ☐ Location shown on site map ☐ Deformation not evident Remarks No deformations observed. Retaining walls in good condition (Photograph 1).
2.	**Degradation** ☐ Location shown on site map ☐ Degradation not evident Remarks No degradation observed. Retaining wall in good condition (Photograph 1).

I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ☒ N/A Remarks:	
VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A	
IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A	
A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☒ N/A	
B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A	
C. Treatment System ☐ Applicable ☒ N/A	
D. Monitoring Data	
1. Monitoring Data ☒ Is routinely submitted on time ☒ Is of acceptable quality	
2. Monitoring data suggests: ☒ Groundwater plume is effectively contained ☒ Contaminant concentrations are declining	
D. Monitored Natural Attenuation	
1. **Monitoring Wells** (natural attenuation remedy) ☒ Properly secured/locked ☐ Functioning ☒ Routinely sampled ☒ Good condition ☒ All required wells located ☐ Needs Maintenance ☐ N/A Remarks Monitoring wells inspected and repaired as needed as part of the Basewide groundwater monitoring program.	
X. OTHER REMEDIES	
If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction. Soil vapor extraction (SVE) System: 1. **SVE wells and conveyance piping** ☐ Functioning ☐ Good condition ☐ Needs Maintenance ☒ N/A Remarks SVE system is currently off and pending removal. 2. **SVE treatment system components** ☐ Functioning ☐ Good condition ☐ Needs Maintenance ☒ N/A Remarks SVE system is currently off and pending removal.	
XI. OVERALL OBSERVATIONS	
A. Implementation of the Remedy	
Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.). Remedy is effective and functioning as intended. SVE reached asymptotic conditions and a soil removal action is planned to address residual volatile organic compounds. Durable covers are intact and maintained and ICs are effective.	

B.	**Adequacy of O&M**
	Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. O&M is effective and addresses routine maintenance to durable covers as needed.
C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future. None observed.
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. No opportunities for optimization outside of efforts to routinely optimize the Basewide groundwater monitoring program network and sampling strategy.

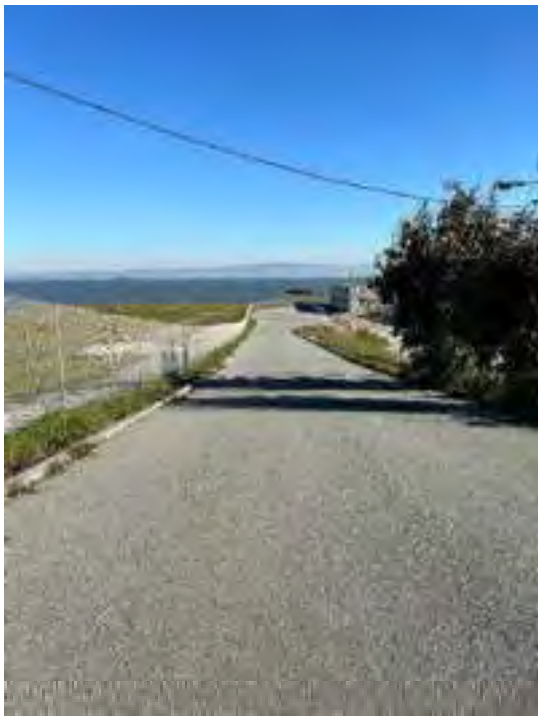
Parcel B-1 Photograph 1: *Retaining wall southwest of Building 113. Facing southeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel B-1 Photograph 2: *Soil cover southwest of Building 103 adjacent to Galvez Avenue. Facing southeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel B-1 Photograph 3: *Outfall protection for storm drainpipe southwest of Building 120. Facing southwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel B-1 Photograph 4: *Asphalt pavement cover southeast of Building 121. Facing northwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel B-1 Photograph 5: *Asphalt pavement cover southwest of Building 121. Cover is generally intact and in good condition. Facing east.*
Photographed by: Marcella Navas/CH2M, 2/9/2023



Parcel B-1 Photograph 6: *Asphalt pavement cover along Donahue Street. Facing northeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel B-1 Photograph 7: *Drainage swale in asphalt pavement cover southwest of Building 123, with accumulation of water. Facing southeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel B-1 Photograph 8: *Soil cover on slope southwest of Building 113. Facing northeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel B-1 Photograph 9: *Drainage swale in asphalt pavement cover southwest of Building 120, with small accumulation of water. Facing southeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel B-1 Photograph 10: *Asphalt pavement cover northeast of Building 113. Facing northwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel B-1 Photograph 11: *Asphalt cover southwest of Building 113. Facing northwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel B-1 Photograph 12: *Driveway northeast of Buildings 103 and 117. Facing northwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel B-1 Photograph 13: *Asphalt pavement cover and soil cover southwest of Building 113. Facing southeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel B-1 Photograph 14: *Drainage swale in asphalt pavement cover southwest of Building 120. Facing southwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

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Five-Year Review Site Inspection Checklist

I. SITE INFORMATION	
Site name: Parcel B-2	**Date of inspection:** 2/9/23
Location and Region: Hunters Point Naval Shipyard San Francisco, CA, Region 9	**EPA ID:** CA1170090087
Agency, office, or company leading the five-year review: Department of the Navy	**Weather/temperature:** Sunny, 50s

Remedy Includes: (Check all that apply)

☐ Landfill cover/containment ☒ Monitored natural attenuation
☐ Access controls ☐ Groundwater containment
☒ Institutional controls ☐ Vertical barrier walls
☐ Groundwater pump and treatment
☐ Surface water collection and treatment
☒ Other Durable cover consisting of a soil cover, shoreline revetment (riprap), asphaltic concrete pavement

Attachments: ☐ Inspection team roster attached ☒ Site map attached

II. INTERVIEWS (Interviews Conducted Separately)

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
☒ O&M manual ☒ Readily available ☐ Up to date ☐Not applicable (N/A)
☐ As-built drawings ☒ Readily available ☐ Up to date ☐ N/A
☐ Maintenance logs ☐ Readily available ☐ Up to date ☒ N/A
Remarks Documents available in the Administrative Record and O&M contractors' offices.

2. **Site-Specific Health and Safety Plan**
☐ Readily available ☐ Up to date ☒ N/A
☐ Contingency plan/emergency response plan ☐ Readily available ☐ Up to date ☒ N/A
Remarks_____

3. **O&M and OSHA Training Records** ☐ Readily available ☐ Up to date ☐ N/A
Remarks_____

4. **Permits and Service Agreements**
☐ Air discharge permit ☐ Readily available ☐ Up to date ☒ N/A
☐ Effluent discharge ☐ Readily available ☐ Up to date ☒ N/A
☐ Waste disposal, POTW ☐ Readily available ☐ Up to date ☒ N/A
☐ Other permits_____ ☐ Readily available ☐ Up to date ☒ N/A
Remarks_____

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks

6.	**Settlement Monument Records** ☒ Readily available ☐ Up to date ☐ N/A Remarks
7.	**Groundwater Monitoring Records** ☒ Readily available ☐ Up to date ☐ N/A Remarks: Groundwater monitoring is reported in annual Basewide groundwater monitoring reports.
8.	**Leachate Extraction Records** ☐ Readily available ☐ Up to date ☒ N/A Remarks
9.	**Discharge Compliance Records** ☐ Air ☐ Readily available ☐ Up to date ☒ N/A ☐ Water (effluent) ☐ Readily available ☐ Up to date ☒ N/A Remarks
10.	**Daily Access/Security Logs** ☐ Readily available ☐ Up to date ☒ N/A Remarks: Guarded security gates at Robinson Street and Crisp Road restrict access to Hunters Point Naval Shipyard. City of San Francisco provides security and maintains access logs.
	IV. O&M COSTS (Not Applicable for Site Inspection)
	V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A
A. Fencing	
1.	**Fencing damaged** ☐ Location shown on site map ☒ Gates secured ☐ N/A Remarks Fencing in good condition.
B. Other Access Restrictions	
1.	**Signs and other security measures** ☐ Location shown on site map ☐ N/A Remarks Signs in generally good condition, buildings locked.
C. Institutional Controls (ICs)	
1.	**Implementation and enforcement** Site conditions imply ICs not properly implemented ☐ Yes ☒ No ☐ N/A Site conditions imply ICs not being fully enforced ☐ Yes ☒ No ☐ N/A Type of monitoring (*e.g.*, self-reporting, drive by) Routine Inspection Frequency Annually Responsible party/agency Navy and Navy O&M Contractors (Aptim Federal Services) Reporting is up-to-date ☒ Yes ☐ No ☐ N/A Reports are verified by the lead agency ☒ Yes ☐ No ☐ N/A Specific requirements in deed or decision documents have been met ☒ Yes ☐ No ☐ N/A Violations have been reported ☐ Yes ☐ No ☒ N/A Other problems or suggestions: ☐ Report attached None
2.	**Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A Remarks None

D. General	
1.	**Vandalism/trespassing** ☒ Location shown on site map ☐ No vandalism evident Remarks Evidence of graffiti on buildings (Photograph 2).
2.	**Land use changes on site** ☒ N/A Remarks _____
3.	**Land use changes off site** ☒ N/A Remarks _____
VI. GENERAL SITE CONDITIONS	
A. Roads ☒ Applicable ☐ N/A	
1.	**Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A Remarks None
B. Other Site Conditions	
	Remarks General site conditions are good. Trenching is being conducted for radiological rework.
VII. COVERS ☒ Applicable ☐ N/A Note that the durable covers onsite are not engineered landfill covers.	
A. Surface	
1.	**Settlement** (Low spots) ☐ Location shown on site map ☒ Settlement not evident Remarks None
2.	**Cracks** ☒ Location shown on site map ☐ Cracking not evident Remarks Minor cracking observed with vegetation growing (Photograph 16).
3.	**Erosion** ☐ Location shown on site map ☒ Erosion not evident Remarks _____
4.	**Holes** ☐ Location shown on site map ☒ Holes not evident Remarks _____
5.	**Vegetative Cover** ☐ Grass ☐ Cover properly established ☐ No signs of stress ☐ Trees/Shrubs (indicate size and locations on a diagram) Remarks No vegetative cover.
6.	**Alternative Cover (Shoreline Revetment)** ☐ N/A Remarks Shoreline revetment in good condition with minor areas of vegetation growth (Photograph 16). No signs of major rock movement.
7.	**Bulges** ☐ Location shown on site map ☒ Bulges not evident Remarks None
8.	**Wet Areas/Water Damage** ☒ Wet areas/water damage not evident ☐ Wet areas ☐ Location shown on site map Areal extent_____ ☐ Ponding ☐ Location shown on site map Areal extent_____ ☐ Seeps ☐ Location shown on site map Areal extent_____ ☐ Soft subgrade ☐ Location shown on site map Areal extent_____ Remarks Standing water present from heavy rains during preceding day.

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☐ No evidence of slope instability Remarks Not applicable.
B. Benches ☐ Applicable ☒ N/A (Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)
C. Letdown Channels ☐ Applicable ☒ N/A (Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)
D. Cover Penetrations ☒ Applicable ☐ N/A
1. **Gas Vents** ☐ Active ☐ Passive ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☒ N/A Remarks_____
2. **Gas Monitoring Probes** ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☒ N/A Remarks_____
3. **Monitoring Wells** (within surface area of landfill) ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☒ N/A Remarks_____
4. **Leachate Extraction Wells** ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☒ N/A Remarks_____
5. **Settlement Monuments** ☐ Located ☒ Routinely surveyed ☐ N/A Remarks Minimal settlement observed; no monuments scheduled for surveying in the next 2 years.
E. Gas Collection and Treatment ☐ Applicable ☒ N/A
F. Cover Drainage Layer ☐ Applicable ☒ N/A
G. Detention/Sedimentation Ponds ☐ Applicable ☒ N/A
H. Retaining Walls ☒ Applicable ☐ N/A

1.	**Deformations** ☐ Location shown on site map ☒ Deformation not evident Remarks None
2.	**Degradation** ☐ Location shown on site map ☒ Degradation not evident Remarks None
I. Perimeter Ditches/Off-Site Discharge ☒ Applicable ☐ N/A Remarks: Swales are located near Building 140 and 130, appear in good condition.	
1.	**Siltation** ☐ Location shown on site map ☒ Siltation not evident Remarks None observed.
2.	**Vegetative Growth** ☐ Location shown on site map ☒ N/A ☐ Vegetation does not impede flow Remarks Swales are in asphaltic concrete pavement.
3.	**Erosion** ☐ Location shown on site map ☒ Erosion not evident Remarks Swales are in asphaltic concrete pavement.
4.	**Discharge Structure** ☒ Functioning ☐ N/A Remarks Discharge point appears in good condition with nothing impeding the flow.
VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A	
IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A	
A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☒ N/A	
B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A	
C. Treatment System ☐ Applicable ☒ N/A	
D. Monitoring Data	
1.	Monitoring Data ☒ Is routinely submitted on time ☒ Is of acceptable quality
2.	Monitoring data suggests: ☐ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining Remarks In situ treatment for mercury was completed but concentrations continue to exceed trigger levels.
D. Monitored Natural Attenuation	
1.	**Monitoring Wells** (natural attenuation remedy) ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ All required wells located ☐ Needs Maintenance ☐ N/A Remarks Monitoring wells inspected and repaired as needed as part of the Basewide groundwater monitoring program.

X. OTHER REMEDIES	
	If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction. Remarks: In situ groundwater remediation was conducted. There are no physical structures or ongoing maintenance.
XI. OVERALL OBSERVATIONS	
A.	**Implementation of the Remedy**
	Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.). Durable cover, ICs are effective and functioning as designed. Groundwater monitoring data for mercury continue to exceed trigger levels after remediation activities were completed.
B.	**Adequacy of O&M**
	Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. O&M efforts to maintain the durable cover and security features are effective.
C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future. None observed.
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. No opportunities for optimization outside of efforts to routinely optimize the Basewide groundwater monitoring program network and sampling strategy.

Parcel B-2 Photograph 1: *Drainage swale in asphalt pavement cover northwest of Building 159. Facing north.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel B-2 Photograph 2: *Drainage swale in asphalt pavement cover and graffiti north of Building 128. Facing west.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel B-2 Photograph 3: *Swale outfall northeast of Building 130. Facing northeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel B-2 Photograph 4: *Swale east of Building 130. Facing south.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel B-2 Photograph 5: *Trenching east of Building 130 located south of outfall. Facing east.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel B-2 Photograph 6: *Trenching east of Building 130. Facing northeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel B-2 Photograph 7: *Shoreline revetment southwest of Building 140. Facing southeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel B-2 Photograph 8: *Shoreline revetment north of Building 140. Facing west.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel B-2 Photograph 9: *Do Not Enter sign and locked door, Building 128. Facing north*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel B-2 Photograph 10: *View of the Building 128 foundation. Facing northwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel B-2 Photograph 11: *Chain-link fence along Parcel B-1 boundary. Facing west.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

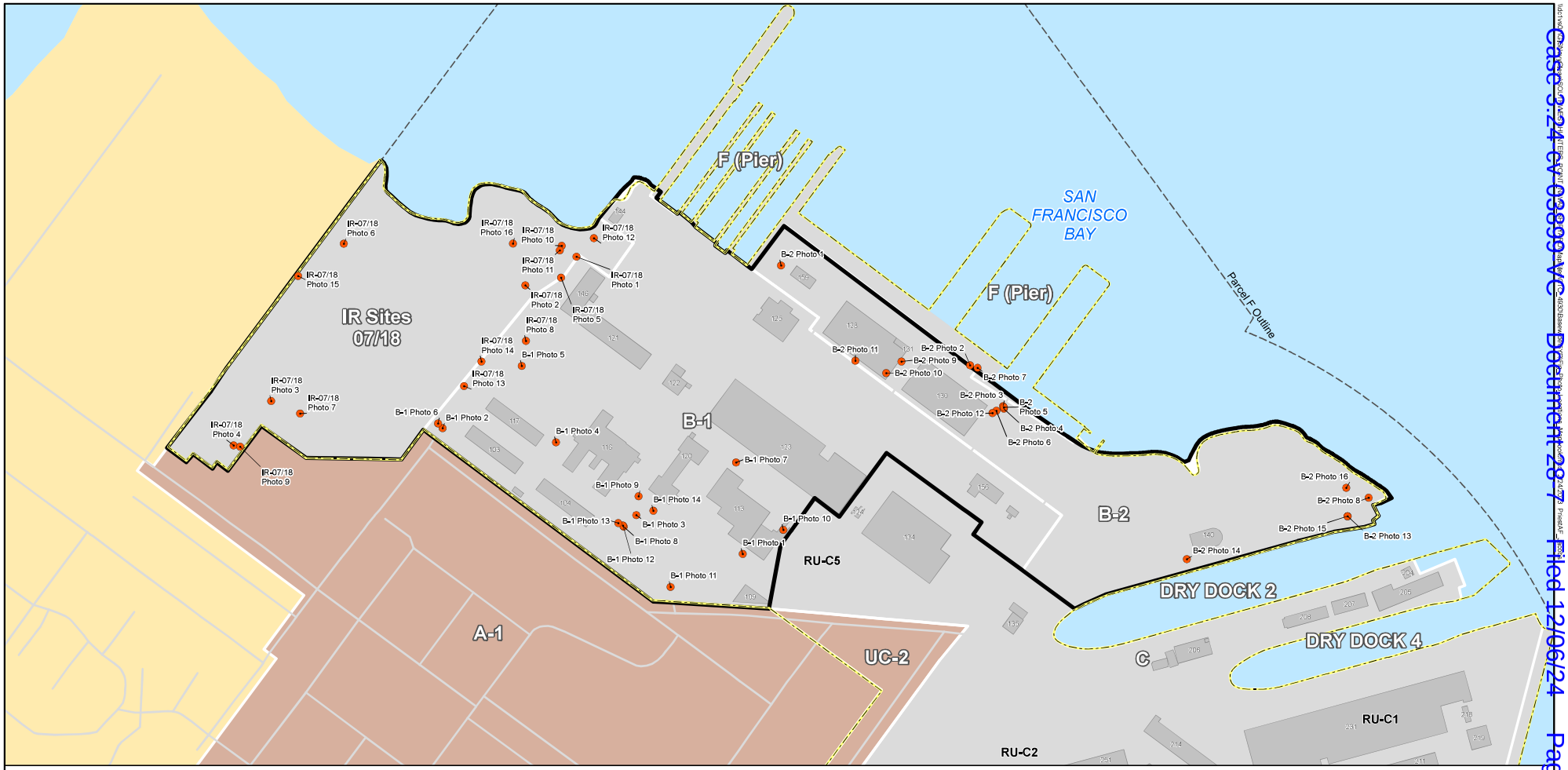
Parcel B-2 Photograph 12: *Monitoring well. Facing southwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel B-2 Photograph 13: *Asphalt pavement cover. Facing west.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel B-2 Photograph 14: *Construction area with containment west of Building 140. Facing northeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

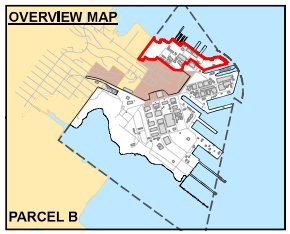
Parcel B-2 Photograph 15: *Asphalt pavement cover. Facing northwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel B-2 Photograph 16: *Revetment crest northeast of Building 140. Facing northwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023



LEGEND

- Hunters Point Naval Shipyard Boundary
- Parcel Boundary
- Parcel F (Water) Boundary
- Former Navy Property
- Non-Navy Property
- Photograph Location
- Water
- Building
- Road



Parcel B (Installation Restoration Sites 07 and 18, Parcels B-1 and B-2)
Five-Year Review Site Inspection Photograph Locations
Five-Year Review of Remedial Actions
Hunters Point Naval Shipyard, San Francisco, California

0 200 400 Feet
1 Inch = 300 Feet
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Five-Year Review Site Inspection Checklist

I. SITE INFORMATION	
Site name: Parcel C	**Date of inspection:** 2/9/23
Location and Region: Hunters Point Naval Shipyard San Francisco, CA, Region 9	**EPA ID:** CA1170090087
Agency, office, or company leading the five-year review: Department of the Navy	**Weather/temperature:** Sunny 50s

Remedy Includes: (Check all that apply)

☐ Landfill cover/containment ☒ Monitored natural attenuation
☐ Access controls ☐ Groundwater containment
☒ Institutional controls ☐ Vertical barrier walls
☐ Groundwater pump and treatment
☐ Surface water collection and treatment
☒ Other Durable cover consisting of a soil cover, shoreline armoring (small area), asphaltic concrete pavement, soil vapor extraction, groundwater remediation (injections).

Attachments: ☐ Inspection team roster attached ☒ Site map attached

II. INTERVIEWS (Interviews Conducted Separately)

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
   ☒ O&M manual ☒ Readily available ☐ Up to date ☐Not applicable (N/A)
   ☒ As-built drawings ☒ Readily available ☐ Up to date ☐ N/A
   ☐ Maintenance logs ☐ Readily available ☐ Up to date ☒ N/A
   Remarks Documents available in the Administrative Record and O&M contractors' offices.

2. **Site-Specific Health and Safety Plan**
   ☒ Readily available ☐ Up to date ☐ N/A
   ☐ Contingency plan/emergency response plan ☐ Readily available ☐ Up to date ☒ N/A
   Remarks Documents available in O&M contractors' offices.

3. **O&M and OSHA Training Records** ☒ Readily available ☐ Up to date ☐ N/A
   Remarks Documents available in O&M contractors' offices.

4. **Permits and Service Agreements**
   ☐ Air discharge permit ☐ Readily available ☐ Up to date ☒ N/A
   ☐ Effluent discharge ☐ Readily available ☐ Up to date ☒ N/A
   ☐ Waste disposal, POTW ☐ Readily available ☐ Up to date ☒ N/A
   ☐ Other permits_____ ☐ Readily available ☐ Up to date ☒ N/A
   Remarks_____

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ☒ N/A
   Remarks

6.	**Settlement Monument Records** ☒ Readily available ☐ Up to date ☐ N/A Remarks Settlement monuments surveyed as part of O&M if required.
7.	**Groundwater Monitoring Records** ☒ Readily available ☐ Up to date ☐ N/A Remarks: Groundwater monitoring is reported in annual Basewide groundwater monitoring reports.
8.	**Leachate Extraction Records** ☐ Readily available ☐ Up to date ☒ N/A Remarks _____
9.	**Discharge Compliance Records** ☐ Air ☐ Readily available ☐ Up to date ☒ N/A ☐ Water (effluent) ☐ Readily available ☐ Up to date ☒ N/A Remarks _____
10.	**Daily Access/Security Logs** ☐ Readily available ☐ Up to date ☒ N/A Remarks: Guarded security gates at Robinson Street and Crisp Road restrict access to Hunters Point Naval Shipyard. City of San Francisco provides security and maintains access logs.
	IV. O&M COSTS (Not Applicable for Site Inspection)
	V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A
A. Fencing	
1.	**Fencing damaged** ☐ Location shown on site map ☒ Gates secured ☐ N/A Remarks Fence in good condition (Photographs 1, 2, 4, 9, 17).
B. Other Access Restrictions	
1.	**Signs and other security measures** ☐ Location shown on site map ☐ N/A Remarks Permanent and temporary signs during active work in good condition (Photograph 19).
C. Institutional Controls (ICs)	
1.	**Implementation and enforcement** Site conditions imply ICs not properly implemented ☐ Yes ☒ No ☐ N/A Site conditions imply ICs not being fully enforced ☐ Yes ☒ No ☐ N/A Type of monitoring (*e.g.*, self-reporting, drive by) Routine Inspection Frequency Annually Responsible party/agency Navy and Navy O&M Contractors (Aptim Federal Services) Reporting is up-to-date ☒ Yes ☐ No ☐ N/A Reports are verified by the lead agency ☒ Yes ☐ No ☐ N/A Specific requirements in deed or decision documents have been met ☒ Yes ☐ No ☐ N/A Violations have been reported ☐ Yes ☐ No ☒ N/A Other problems or suggestions: ☐ Report attached None; no incompatible land uses observed or unauthorized intrusive activities.

2.	**Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A Remarks None
D. General	
1.	**Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident Remarks None
2.	**Land use changes on site** ☒ N/A Remarks None
3.	**Land use changes off site** ☒ N/A Remarks None
VI. GENERAL SITE CONDITIONS	
A. Roads ☒ Applicable ☐ N/A	
1.	**Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A Remarks None
B. Other Site Conditions	
	Remarks Active work is being conducted related to radiological rescanning efforts; many areas of site are inaccessible while work is ongoing but stormwater best management practices are in use (Photographs 9, 11, 12).
VII. COVERS ☒ Applicable ☐ N/A Note that the durable covers onsite are not engineered landfill covers.	
A. Surface	
1.	**Settlement** (Low spots) ☐ Location shown on site map ☒ Settlement not evident Remarks None
2.	**Cracks** ☐ Location shown on site map ☐ Cracking not evident Remarks Minimal cracking outside of active treatment areas, large areas of piers are fenced off due to sinkholes identified during O&M, repairs will be completed when trenching work is complete.
3.	**Erosion** ☐ Location shown on site map ☒ Erosion not evident Remarks Soil cover is in good condition with no apparent erosion. Not all of the site was able to be inspected because of fencing and active work.
4.	**Holes** ☐ Location shown on site map ☐ Holes not evident Remarks Not all of the site was able to be inspected because of fencing and active work. Past O&M records indicate sinkholes and potholes occur along waterfront.
5.	**Vegetative Cover** ☒ Grass ☒ Cover properly established ☒ No signs of stress ☐ Trees/Shrubs (indicate size and locations on a diagram) Remarks Cover in good condition (Photographs 1 and 2).
6.	**Alternative Cover (Shoreline Revetment)** ☒ N/A Remarks Unable to access during inspection. O&M reports consistently note shoreline revetment is in good condition.
7.	**Bulges** ☐ Location shown on site map ☒ Bulges not evident Remarks Not applicable for durable cover.

8.	**Wet Areas/Water Damage** ☐ Wet areas/water damage not evident ☒ Wet areas ☐ Location shown on site map Areal extent_____ ☐ Ponding ☐ Location shown on site map Areal extent_____ ☐ Seeps ☐ Location shown on site map Areal extent_____ ☐ Soft subgrade ☐ Location shown on site map Areal extent_____ Remarks Water present in drainage swales and in an active trench from recent heavy rains.
9.	**Slope Instability** ☐ Slides ☐ Location shown on site map ☐ No evidence of slope instability Remark Not applicable at Parcel C.
B. Benches	☐ Applicable ☒ N/A (Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)
C. Letdown Channels	☐ Applicable ☒ N/A (Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)
D. Cover Penetrations	☒ Applicable ☐ N/A
1.	**Gas Vents** ☐ Active ☐ Passive ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☒ N/A Remarks
2.	**Gas Monitoring Probes** ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☒ N/A Remarks
3.	**Monitoring Wells** (within surface area of landfill) ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☒ N/A Remarks See Groundwater Monitoring section.
4.	**Leachate Extraction Wells** ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☒ N/A Remarks
5.	**Settlement Monuments** ☐ Located ☐ Routinely surveyed ☒ N/A Remarks Not scheduled for surveying in the next 3 years at Parcel C.
E. Gas Collection and Treatment	☐ Applicable ☒ N/A
F. Cover Drainage Layer	☐ Applicable ☒ N/A
G. Detention/Sedimentation Ponds	☐ Applicable ☒ N/A
H. Retaining Walls	☐ Applicable ☒ N/A